Racial Discrimination in the Atlanta Mortgage Market, 2012 - 2017
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Introduction

A strong body of research supports the presence and persistence of a racial wealth gap between Black and white households. Examining the racial wealth gap is important because wealth is key to economic stability and upward mobility of families. Having wealth affects families' ability to face current and future financial challenges such as paying for unexpected medical bills, affording down payments for homes, or investing in new business ventures and opportunities. Throughout history, however, Blacks have been systematically denied access to key ways to build wealth as accessing college education, homeownership, and investment opportunities. Chief among these is homeownership.

Lending decisions in the mortgage market – whether to approve or deny a home purchase loan – are made according to lender underwriting thresholds and requirements. However, if underwriting procedures lead to a disproportionate number of Black and Hispanic applicants being denied, this system is locking out households of color.

The purpose of this research is to examine mortgage lending patterns and determine if Black and Latino applicants are more likely to be denied for a loan than white applicants. Further, the analysis will identify specific reasons for denial faced by Black and Latino applicants in the mortgage market. This information provides more specificity to the barriers faced by households of color in obtaining homeownership and guides the policy ideas and recommendations identified in this paper.

There are four major parts to this research paper:

1) A literature review on the context of the racial wealth gap, power of wealth creation, barriers to homeownership, impact of policy change, and evidence on racial discrimination in the mortgage market.
2) An overview of the trends in home origination and denial by race within Atlanta mortgage market for the years 2012 – 2017.
3) A review of HMDA data and a look at how denial rates and reasons for denial differ by race and the interaction of race and income.
4) An examination of policy ideas that respond to the results of this study and warrant further consideration and attention

Research Questions

This research seeks to answer the following questions within the sections outlined above:

1) How have mortgage originations and denials trended over space and time?
2) Are Black and Latino applicants more likely to be denied for a loan than white applicants?
3) Are Black and Latino applicants more likely to be denied for *particular reasons* than white applicants? If yes, what are those reasons?
4) How does the interaction between race and income affect denial rates and reasons for denial?

Literature Review

Recent studies present compelling evidence of not only the persistence of the racial wealth gap but also the inextricable link between home equity and wealth. In addition, research supports that homeownership continues to provide a tremendous wealth building opportunity. The benefits of wealth creation and home appreciation are felt across race and ethnicity. Beyond wealth, the stability that homeownership provides households promotes positive health outcomes, economic well-being, and student achievement. In accessing these benefits, there are several barriers including challenges to saving for down payments, living with impaired credit, and facing the shrinking supply of affordable homes. The first two of these barriers—challenges to saving and impaired credit—falls largely along racial and ethnic lines, thereby increasing the importance of examining the reasons for denial of home mortgages across race and ethnicity. The literature review shares the context of the racial wealth gap, the connection of homeownership and wealth creation, impact of policy change on Black homeownership and wealth generation, and evidence on racial discrimination in the mortgage market.

The Racial Wealth Gap

Significant evidence indicates that over the past forty years the racial wealth gap—the gap in wealth between Black and Latino households and white households—has increased. White families had eight times more wealth than Black families in 1983 (Moore and Bruenig, 2017). By 2016, the gap has widened (Moore et al., 2017). The average wealth of non-Hispanic white households ($171,000) has grown to ten times the average wealth of Black households ($17,409). Of Black wealth that exists, 95 percent is owned by the top 20 percent of Black households (Moore et al., 2017).

Measuring wealth in the form of home equity is significant because this type of wealth accounts for a greater part of net worth for Black households than it does for white households. An analysis of Federal Reserve data found that "primary residences account for 58 percent of African Americans' net worth, compared with 40 percent of whites' wealth portfolio… Yet, in 2016, the mean net housing wealth of white homeowners was $215,800, compared with only $94,400 among Black homeowners" (Center for American Progress, 2019). While Black households main source of wealth originates from the ownership of their primary home, overall Black wealth from homeownership constitutes less than half as much as that of whites.

Despite the evidence that homeownership offers a significant wealth-building opportunity for low-income and Black households, the homeownership gap between Blacks and whites is substantial and growing. In the past twenty years, the white homeownership rate has risen by 3.6 percent to 72.3 percent, while the Black homeownership rate has fallen to 40.1 percent, creating the largest disparity since World War II (JCHS, 2018; Census Bureau Quarterly Data Report, 2019). In addition, this rate (40.1 percent) is well below the rate after the passage of the Fair Housing Act 50 years ago (49.7 percent). Black homeownership has not been this low since the time that housing discrimination was legal.

There have been several studies that have measured the magnitude of the racial wealth gap. One, led by a research group at Brandeis University, developed a Racial Wealth Audit, a tool that measures the impact of housing, education, and labor markets on the racial wealth gap and assesses how equalizing outcomes for different race and ethnicities would reduce the divide (Traub & Ruetschlin, 2016). The authors find that if Black and Latino households owned homes at the same rate as white households, median Black wealth would grow $32,113, and median Latino wealth would grow $29,213 (Traub & Ruetschlin, 2016).

Another study found that equalizing the return on homeownership between Blacks and whites would shrink the racial wealth gap by 31 percent" (Demos and Institute for Assets and Social Policy, 2016). These analyses indicate the strong connection between homeownership and wealth generation and demonstrate the vital role homeownership plays in alleviating the racial wealth divide.

Wealth Creation Power of Homeownership

Homeownership is more financially advantageous, over time, than renting. Homeownership offers households a "forced savings" mechanism that grows as a result of "housing payments that go toward gaining equity in the home" (Immergluck Earl, and Powell, 2018). Through these consistent housing payments, households can benefit if their homes appreciate over time. In addition, homeowners benefit from fixed mortgage programs and taxation policy through the mortgage interest deduction, homestead exemptions, and property tax limitations that "shield them from unpredictable and volatile changes in rent and land values due to gentrification and economic pressures" (Immergluck et al., 2018).

Though the mortgage lending crisis disproportionately affected Black homeowners than those of other races, a study using Survey of Consumer Finances (SCF) data suggests that in the time of recovery, between 2013 and 2016, Black homeowners saw slightly greater appreciation rates than whites, a difference of 1.5 percent (JCHS, 2018). Further research of home price appreciation of fifteen U.S. metropolitan areas found that around the same period, between 2012 and 2017, Black homeowners experienced an average 8.3 percent greater home value appreciation than white households (Immergluck et al., 2018). This research supports that, in appreciating metros, homeownership is a highly financially beneficial investment for Black households.

Other Benefits of Homeownership

Beyond reducing the racial wealth gap, increasing Black homeownership offers Black families and communities of color additional benefits beyond wealth creation. More broadly, homeownership provides a platform of stability for low-income families and households of color to enhance their overall well-being and the lives of their children. Research suggests that the stability enabled by homeownership leads to improvements in health outcomes, economic mobility, and student achievement and a greater sense of community engagement and pride (Pew Charitable Trust, 2013).

Inversely, research indicates that student performance suffers when children move frequently, which is commonly the case for families that rent and not own (Reynolds, Chen, and Herbers, 2009). High student mobility is particularly true in neighborhoods experiencing gentrification, where renters are twice more likely to be displaced than homeowners, since rents typically rise more quickly and dramatically than property taxes. In addition, homeowners are more likely to stay put in such communities given strong community connection and gains from home appreciation (Florida, 2017; Martin and Beck, 2018).

Because homeownership provides a built-in saving mechanism, it is often be more affordable than renting: "The median [American] family spends 28.1 percent of its income to pay rent but spends only 26.8 percent of its income to afford the monthly mortgage payment, including taxes and insurance" (Urban Institute, 2018a). The increased saving potential of homeownership offers low income families

and people of color the opportunity to use their cost savings toward health care, further education and professional opportunities, emergency costs, and other needs.

Barriers to Homeownership

Recent studies present barriers to homeownership for Black and Latino households. These barriers include: 1) Challenges to Saving for Down Payment and Other Homeownership Costs 2) Impaired Credit and 3) Shrinking Supply of Affordable Homes

Barrier 1: *Challenges to Saving for Down Payment and Other Homeownership Costs*

According to the Joint Center for Housing Studies' "State of the Nation's Housing" Report, "The largest barrier for first-time buyers is insufficient savings to meet downpayment requirements and other upfront costs" (JCHS, 2018). This trend is especially heightened for Black households as half are first-time home buyers and a majority have fewer resources for down payments from family or inheritance than white households (McMullen 2019; Shapiro, Meschede, and Osoro, 2013).

Rising rental costs are making it more difficult for Black renters to save for down payments required for homeownership. In addition, welfare programs like Supplemental Nutrition Assistance Program (SNAP) and Temporary Assistance for Needy Families (TANF) are structured in ways that disincentivize their beneficiaries from accruing wealth. For example, in some states, welfare recipients lose their benefits if they have more than $1,000 in the bank or own cars worth more than $4,650. Many of them, too, would have to give up competitive rent subsidies to own a home (Amadeo, 2018).

Low usage of retirement programs and student loan debt make it more difficult for Black households to afford the costs of homeownership (Urban Institute, 2017). Black workers are less likely to participate in employer retirement plans and are more likely to have lower liquid retirement savings and to withdraw money early to cover financial emergencies (Urban Institute, 2017).

The increase in student loan burden among Black households partly explains the drop in homeownership rates among Black millennials, decreasing 9.7 percent between 2000 and 2015. In 2015, the Black homeownership rate among millennials was 13.4 percent compared to white millennials at 39.6 percent (Urban Institute 2018b). Reducing the student loan debt among Black millennials can help close the racial wealth gap and help young Black households save for homeownership.

Another key barrier to saving for homeownership is the availability of down payment assistance (DPA) programs. Although there are 2,527 active down payment programs across the country, only 3 percent of homes sold nationwide are closed with DPA. The low usage of DPA programs may be attributable to several reasons: 1) households may not be aware of the program and, as a result, do not take advantage of its benefits 2) the requirements to be eligible for DPA may eliminate a large pool of otherwise eligible homebuyers 3) DPA programs have little funding available and therefore are unable to provide additional financial assistance (Urban Institute, 2018a).

Barrier 2: *Impaired Credit*

Since the mortgage lending crisis of 2007, banks have tightened their credit requirements for mortgage loans. According the Urban Institute, the median credit score requirement for mortgages has increased by 20 points in the past decade (2018a).

As a result of the predatory practices of the subprime mortgage crisis, the credit of many Black households became negatively impaired. Those experiencing foreclosure or default received irreversible damage to their credit scores. As a result of lower credit scores, Black borrowers now turn to mortgages by the Federal Housing Administration (FHA) that accepts their lower credit scores. However, FHA mortgages tend to be higher cost compared to conventional mortgages securitized by Fannie Mae and Freddie Mac. FHA mortgages allow borrowers to provide a lower down payment but, must pay mortgage insurance as a result of a lower downpayment requirement. Mortgage insurance increases the upfront costs and monthly mortgage payments and together become a barrier for Black families in obtaining and sustaining homeownership.

Black mortgage applicants experience higher loan denial rates than whites: 18 percent of Black applicants are denied for a loan compared to 9 percent white applicants in 2016 (NAREB, 2018). These denials are largely attributed to Black applicants' lower credit scores and higher debt to income ratios (NAREB, 2018). Informed by these findings, this analysis aims to update past research on denial rates and reasons for denial with a focus on the Atlanta Metropolitan Statistical Area (MSA).

Barrier 3: *Shrinking Supply of Affordable Homes*

Dramatic changes in the construction sector including escalating labor costs, shortage of skilled workers, lack of cost innovation, and rising land costs – push prices upward and increase the cost of construction and rehabilitation, making the ability to construct affordable homes more difficult (JCHS, 2018). In addition, recent research finds that "more [zoning] regulations result in higher house prices and less construction" (Urban Institute, 2018b). Because builders spend more time and money obtaining zoning permits and are more constrained with what they can build, they face more barriers in these areas to build affordable homes.

In addition, the supply of homes for affordable homeownership has been limited by the conversion of single family homes to rental housing. From 2006 to 2016, 3.8 million single-family homes were converted to rental in the U.S. (JCHS, 2018). In 2017, nearly one in every five single-family homes is renter-occupied (Galante, Reid, and Sanchez-Moyano, 2017). In the Atlanta metro, many these rental homes are owned and operated by institutional investors. In 2017, these investors bought 5,000 homes and own as many as 20 percent of the single family housing stock in areas of the Atlanta MSA. (Semuels, 2019).

This research focuses on gaining insight on the first two barriers: challenges to saving and impaired credit as well as identifying other reasons for denial as reported by lenders and reflected in HMDA data. By uncovering the causes of denial for home mortgage loans, this research can offer evidence-based feedback that can inform mortgage lending practices, policy, and future research.

Debate of Economics or Prejudice

Much disagreement surrounds how to define and measure racially discriminatory behavior over the past 50 years since the Fair Housing Act. Economists, on one side of the argument, argue that a rational lender or underwriter has no reason to be prejudice as being so would translate to a loss in profits. One of those economists, Gary Becker, published a book on the economics of discrimination. According to Becker, "discriminatory behavior emerges from prejudice or a 'taste for discrimination' and requires that the discriminator pay or forfeit income for the privilege of exercising prejudicial tastes" (Ladd, 1998). In the mortgage lending field, this argument justifies lenders working in a way that would maximize profit. If their actions have a disparate impact on a protected group, it was not because of their own prejudice or bias; rather, it is because members of the protected class have characteristics that make them less eligible for a loan. According to this theory, the lender has not acted in a racially discriminatory way but rather in a way that aims to be profitable and financially sound.

On the other side, social scientists argue that racism economically benefits powerful institutions and white homeowners who have a vested interest in maintaining segregation and systems which perpetuate disparate impact. They recommend stricter enforcement of antidiscrimination laws believing that "the benefits from increased social justice for minorities are worth more than the costs of potentially inefficient behavior by lenders" (Ladd, 1998).

This research follows the line of social scientists in this debate and assumes that disparate impact as a result of lender decision-making is a form of racial discrimination. Such discrimination must be acknowledged and corrected with powerful policy solutions. The goal of this research is to two-fold: 1) identify evidence of racial discrimination in the mortgage lending origination process and 2) provide areas of focus that can serve as a breeding ground for new practice and policy that promotes homeownership attainment among households of color.

Impact of Housing Policy on Homeownership

The history of housing policy suggests that changes in policy rather than changes in economic status have had a larger impact on improved homeownership rates among households of color. After the passage of the 1968 Fair Housing Act, hallmark legislation that banned discrimination in the mortgage and rental housing market, homeownership rates for Black, Latino, and low income families rapidly increased. Black homeownership rose to nearly 50 percent. However, since that time, homeownership rates among households of color and low income people have decreased. This trend is attributable in part to discrimination in the form of higher-cost, high-risk lending practices during the subprime lending crisis that resulted in high-foreclosure rates among Black households (Faber, 2013; Agrawal et al., 2014; Immergluck et al., 2018).

Changes in the economic climate, mortgage and housing market, and regulations of those markets account for an increase in homeownership among lower income and Black households between 1989 and 1998 (Bostic and Surette, 2001). In addition, family-related characteristics such as head of household, age, number of children are not significant for changes in homeownership among lower income and lower income minority families but, play a larger role for higher income families (Bostic and Surette, 2001). These findings suggest that larger policy changes in the mortgage market such as lower interest rates and improved lending practices have a larger impact on low income families and households of color than individual characteristics of families such as improved economic status.

Racial Discrimination in Mortgage Lending

The ability to buy a home depends an individual's ability to be approved for a home mortgage. Lenders determine whether to approve a loan application. Mortgage lenders include depository institutions such as commercial banks, mutual saving banks, and saving and loan associations, and non-depository institutions such as mortgage banking companies. To prevent discrimination in the mortgage lending market, the United States Congress passed a series of laws that made it illegal to discriminate based on race, gender, or ability. The Equal Credit Opportunity Act of 1974 (ECOA) made it illegal for lenders to decide whether to approve a loan based on the racial composition of the neighborhood. The Community Reinvestment Act (CRA) of 1977 gave teeth to ECOA by requiring that depository institutions to meet the credit needs of low and moderate income communities. Prior to the passage of ECOA and CRA, banks refused to offer lending and other financial services to low and moderate income communities of color because they were identified or 'red-lined' as high-risk investments (Federal Reserve, 2019).

In 1975, the Home Mortgage Disclosure Act (HMDA) was passed. This law required lenders to report information on their mortgage lending by census tract. In 1989, revisions to HMDA required lenders to report characteristics of individual applicants including their race, gender, and income. The new information allowed for the examination of disparate impact by race, age, and income in denial rates among individual applicants.

These laws allowed for greater accountability of fair lending in the mortgage market. Research of differential treatment of minority groups by lenders can be best organized into three categories: *1) Differences in Loan Denial Rates 2) Differences in Loan Default Rates 3) Evidence of Geographic Redlining*. This analysis focuses on the first category: differences in loan denial rates.

A body of research provides compelling evidence of discrimination against Blacks in the loan denial decision-making process. One study obtained detailed data on loan applications for state regulated Savings and Loan banks in California and commercial banks, savings and loan banks in New York in 1976 – 1978. The control variables for the California analysis included applicant income, income relative to requested loan, the LTV ratio, income of secondary earners, age of applicant, age of property, and several neighborhood (census tract or zip code) characteristics such as income, population change, average sales price, and vacancy rate (Schafer and Ladd, 1981). The control variables for the New York analysis included "income, net wealth, years at present occupation, requested loan amount in relation to current income, and the ratio of the requested loan amount to the appraised value of the property" as well as applicant age and several neighborhood variables such as "income of residents, changes in come and population, and mortgage foreclosure and delinquency rates (Schafer and Ladd, 1981). The authors of the study were unable to get data on credit history of applicants in either New York or California.

The methods of the study included a multinomial logit analysis that treated the loan decision as a four way choice. The authors found considerable evidence of discrimination against Blacks in the loan denial decision: "Black applicants have significantly higher chances of denial than whites in similar circumstances in eighteen of the thirty-two California study areas and six of the ten New York study areas" (Schafer and Ladd, 1981). The differences are large: Black applicants are 1.58 to 7.82 times as likely to be denied as are similar white applicants" (Schafer and Ladd, 1981). The lack of information on credit score suggests that the results may be affected by omitted-variable bias.

In 1989, data requirements to the Home Mortgage Disclosure Act were updated to include lender and neighborhood (census tract-level) data. The addition of this data presented new opportunities to examine the role of neighborhood and race in decisions made my lenders. Research on this updated data shows differences in denial rates on home mortgage applications by race and income of applicants, and by average income and racial composition of neighborhoods. These results match those of the study previously shared by Robert Schafer and Helen Ladd in 1981. (Avery, Beeson, & Sniderman 1993; Canner and Smith 1991, 1992).

The seminal work on home mortgage lending discrimination was done by a team of researchers at the Boston Fed in 1996. To minimize the probability of omitted variable bias, Alicia Munnell, Geoffrey M.B. Tootell, Lynn Browne, and James McEneaney organized and implemented a study that supplemented HMDA data with 38 additional variables that "lenders, underwriters, and other familiar to the lending process [consider as] important" (Munnell et al., 1996). These variables covered a wide array of information about the applicant borrower that were needed to control for legitimate differences in the applicant's creditworthiness (Munnell et al., 1996).

The study found that race was a statistically significant and influential factor in how lending decisions were made (Munnell et al., 1996). The probability of loan denial was 8.2 percentage points higher for Blacks and Hispanics than for whites, controlling for probability and costs of default and for loan and personal characteristics (Munnell et al., 1996). Despite scrutiny about the study's results, the large differences in loan denial rates between Black and Hispanic applicants and white applicants could not be "explained away by data errors, omitted variables, or interrelationships between factors that influence loan approval (endogeneity)" (Turner and Skidmore, 1999). The study's finding of "differential denial rates" provided, at the time, strong evidence of the existence of racial discrimination in home mortgage lending in Boston (Munnell et al., 1996).

The Boston Fed study was limited to one loan product (home purchase loans), one city, and one year. It is unclear whether Munnell et al.'s conclusions can be generalized or are specific to Boston. In addition, the study was focused on the mortgage lending institution and the applicant. A study aimed to determine whether racial differences in lending stem from "variations in applicant characteristics (other than race), differences in neighborhoods in which the properties are located, or racial differences that cannot be explained by these factors" (Avery, Beeson, and Sniderman, 1993). This study used estimates from fixed-effects linear probability model to determine racial differences in application denial rates for three home products (home purchase, refinance, and home improvement) for years 1990 and 1991 (Avery et al., 1993). The regression included five components 1) economic characteristics of the applicant including income, loan amount, and loan type 2) overall denial rates of the lenders receiving the application 3) the metropolitan statistical areas (MSAs) 3) census tract locations of the property and 5) an unexplained residual. The study found that denial rates for minority applicants to be consistently higher than those for white applicants with otherwise identical attributes and who are applying for loans with the same lenders and for properties located in the same neighborhoods (Avery et al., 1993).

The study also found significant neighborhood effects that differ across racial groups: Blacks, are more likely to apply for loans for properties located in neighborhoods with higher denial rates than are white applicants. These trends are consistent across geographic markets and loan products, "indicating that the observed racial differences in denial rates are widespread and cannot be attributed to a small subset of markets" (Avery et al., 1993). The analysis uncovered considerable differences in denial rates related to the race of the applicant, even after controlling for several applicant characteristics (Avery et al., 1993).

Research on the relationship between race and mortgage denial rates strongly demonstrates that Black and Latino applicants are more likely to be denied for a loan than white applicants. There are two goals to this research. First, it is to determine whether Atlanta MSA follows the pattern of 30 – 40 years prior: are Blacks and Latinos still more likely than whites to be denied for a loan? Another goal is to determine whether individuals of a certain race or ethnicity are more likely to be denied for certain reasons for denial. Though this research focuses on the Atlanta MSA, the results of this analysis may shed light on possible trends that affect other large metro areas and thus warrant further study.

Data and Methods

Why Atlanta MSA?

The Atlanta MSA is the number one metro region for income inequality and second to last for upward mobility (Bloomberg, 2018; Chetty et al., 2014). These statistics are felt most by Black Atlantans that make up 32.9 percent of the total population (Prosperity Now, 2019). In Atlanta, 58.9 percent of Black households in metro Atlanta are liquid asset poor compared to 26.3 percent of whites (Prosperity Now, 2019). Being liquid asset poor means not having enough savings to cover three months of expenses at the poverty level (Prosperity Now, 2019). Median household income is $26,649 lower for Blacks ($43,333) than whites ($70,083) in metro Atlanta, where people of color are 3.1 times more likely to be impoverished; 2.1 times more likely to be uninsured; and 1.8 times more likely to be unemployed than whites (Prosperity Now, 2019).

These racial disparities are the result of a long history of discriminatory practices and structural racism. Today, these injustices have been exacerbated by the impacts of the recent economic recession which disproportionately affected Blacks and households of color. Blacks were 103 percent more likely than whites to receive subprime mortgages leading up to the 2007 foreclosure crisis, and more than twice as likely to foreclose on their homes in its aftermath (Immergluck et al., 2018). Home values fell much farther in communities of color - particularly in Black communities - and have been much slower to recover, leaving homeowners in majority-Black communities twice as likely to be underwater on their mortgages as those in majority-white communities (Immergluck et al., 2018). Measuring racial discrimination in the Atlanta MSA becomes important when considering its continued presence and lingering effects in the mortgage market.

The decision to focus this research on the Atlanta MSA is also a personal one. As a life-long Georgian, it is important for me to examine and answer these questions about the place I consider home. I have noticed many other organizations, residents, researchers, practitioners of Atlanta care about this issue as much as I do. I am committed to conducting research in a way that would allow for the uncovering of new policy ideas and procedures that can reduce the racial wealth gap in this region.

Decision of Time Period

Since the 2007 subprime lending crisis, the number of home purchase loans in the Atlanta MSA began to increase in 2012 and has continued to climb each year. The last year of available HMDA data is 2017. As a result, this research uses Home Mortgage Disclosure Act (HMDA) data for the period of 2012 – 2017.

Local trends in homebuying are consistent with national trends. Home purchase originations continued the upward trend beginning in 2011 (Dietrich et al., 2018). First-lien owner-occupied home purchase originations increased to 3.7 million in 2017, the highest since 2007 (Dietrich et al., 2018). Black borrowers increased their share of home purchase loans for one-to-four family, owner-occupied properties in 2017, the fourth consecutive annual rise for this group (Dietrich et al., 2018). The average loan amount for Hispanic white borrowers in 2017 was approaching but still below the 2006 peak (Dietrich et al., 2018). All race and ethnic groups experienced increase in average loan amounts for home purchase loans from 2016 to 2017 (Dietrich et al., 2018).

During this time period—2012 - 2017, Black homeowners experienced an average 49.9 percent home value appreciation compared to 45.6 percent of whites in the Atlanta MSA (Immergluck et al., 2018). This time period is significant because it represents a period of recovery from the 2007 subprime lending crisis for whites, Blacks, and Hispanics. Measuring disparate impact in the mortgage lending market at a time of recovery may provide evidence of more implicit forms of racial discrimination.

Data

The studies shared in the literature review provide the basis for the data and methods for the research model. The model uses Home Mortgage Disclosure Act (HMDA) data for the Atlanta Metropolitan Statistical Area (MSA) during the period of recovery, 2012 - 2017. The dataset does not include home refinance and home improvement loans because these applications are likely to be originated by existing homeowners. In addition, the data includes home purchase applications for owner-occupied homes and excludes non-owner-occupied homes. Since race is the major factor of the dataset, records without race data were not included in the dataset. Since the data focuses on loan originations and denials, withdrawn applications were not included in the dataset. The regression includes four parts: 1) the characteristics of the applicant including race, ethnicity, gross annual income, and loan amount 2) characteristics of the census tract where the subject property is located including the average income, minority percentage, total occupied units, and number of 1-4 family units in the census tract 3) action taken by the agency receiving the home purchase application (either a loan approval or loan denial) and 4) reasons for denial if the application was rejected.

The study by Munnell et al. included small alterations to their model to check whether their results were robust. After applying these measures to their analysis, they noticed that they had little impact on their estimate of discrimination. The following regression models includes these alterations. They include removing withdrawals from the dataset and including and examining interaction terms.

As can be observed by Table 1, the total number of observations is 452,144. 65.6 percent of applicants are white and 25.1 percent are Black. 6.7 percent of applicants are Latino or Hispanic. 64 percent are male and 35.7 percent are female. The mean annual income is 94,470 and the mean loan request is 222,450. The average minority population of the census tract is 40.68 percent and the average income of the tract is 83,730. The average number of owner-occupied units for a given tract is 1,881 and the average number of 1-4 family units for a given tract is 2,382. Each denial reason is listed in the Table 1. Among the nine possible outcomes, debt-to-income, credit history, and collateral were the most common reasons for denial.

Appendix A-B shares the variables for this analysis by transformations, source, and type (Appendix A) and the HMDA codebook (Appendix B).

Table 1: 2012-2017 HMDA Data of Sandy Springs/Atlanta MS; Total Observations: 452,144

Variable	Min	Max	Mean	SD	Units
Race: White applicants	0	1	0.656	0.475	% of Applicants
Race: Black applicants	0	1	0.251	0.434	% of App
Ethnicity: Hispanic or Latino applicants	0	1	0.067	0.250	% of App
Sex: Female Applicants	0	1	0.357	0.479	% of App
Sex: Male Applicants	0	1	0.640	0.480	% of App
Gross Annual Income	1	9,999	94.47	107.84	Thousands of Dollars
Loan Amount Requested	1	9,000	222.45	153.89	Thousands of Dollars
Minority Population Percentage by Tract	0	100	40.68	25.36	% of App
Tract Income	0	262.33	83.73	33.46	Thousands of Dollars
Number of Owner Occupied Households	0	5627	1881.74	978.46	Count
Number of 1-4 Family Units	0	6695	2382.14	1186.41	Count
Actions Taken: (0) **Loan Approved** *The following are grouped into one variable:* - Loan Originated - Loan Approved Not Accepted - Preapproval Accepted by Institution	0	1	0.835	0.370	% of App
Actions Taken: (1) **Loan Denied** *The following are grouped into one variable:* - Application Denied by Institution - File Closed for Incompleteness - Preapproval Denied by Institution	0	1	0.164	0.370	% of App
Denial Reason: Collateral	0	1	0.020	0.140	% of App
Denial Reason: Credit App Incomplete	0	1	0.012	0.108	% of App
Denial Reason: Credit History	0	1	0.023	0.150	% of App
Denial Reason: Debt-to-income Ratio	0	1	0.027	0.163	% of App
Denial Reason: Employment History	0	1	0.004	0.067	% of App
Denial Reason: Insufficient Cash	0	1	0.008	0.089	% of App
Denial Reason: Mortgage Insurance Denied	0	1	0.000	0.020	% of App
Denial Reason: Unverifiable Information	0	1	0.008	0.089	% of App
Denial Reason: Other	0	1	0.011	0.105	% of App

84 percent of the time the loan application was originated, approved but not accepted by the borrower, or preapproved. Ultimately, this analysis aims to identify whether lenders are disproportionately denying loans of Black and Latino households. Summarizing loan decisions by approval and denial is necessary to understand the decisions being made by lenders. As a result, these 'approval' variables within HMDA data—loan is originated, loan is approved but not accepted, and loan is pre-approved—are grouped together into one variable: *Loan Approved*. This is because in all three circumstances, the loan was approved by the financial institution.

16 percent of the time the loan was denied by the institution, the preapproval was denied by the institution, or closed for incompleteness. As can be observed by Table 1, three variables –application is denied, file is closed for incompleteness, and pre-approval is denied—are grouped to form 1 variable: *Loan Denied*. The decision to group these variables into one composite variable is because in all three circumstances, the application was considered insufficient or inadequate for approval. The personal characteristics of the borrower in the circumstances where these actions were taken are important to the ultimate objective of determining the role of race in loan denials.

Methods

There are two sets of logit regression models for this study. The first set is a logistic regression depicted in Figures 1a and 1b. To control for potentially confounding factors, the regression includes census tract specific information including average income, percentage minority, number of owner-occupied units, and number of 1-4 family units. These variables may influence approvals and denials in the home mortgage lending process. As a result, including these variables in the model separates their effects from the independent variables: characteristics of the applicant.

The regression in Figure 1a includes the independent variables: income of applicant, race of applicant, income of tract, percent minority of tract, owner occupied households (count), and 1-4 family units (count). The dependent variable of the model includes a dummy variable for "Action Taken" which refers to the decision made by the lender. For a logit regression, the most common dependent variable choice is considered the base. In this case, the base is equal to the pool of applications that are approved but not accepted, pre-approved, and originated. This variable is called *Loan Approved*. In the regression models for Figures 1a and 1b, all other choices will be compared to this base.

Figure 1a: Logistic Regression, Loan Decision

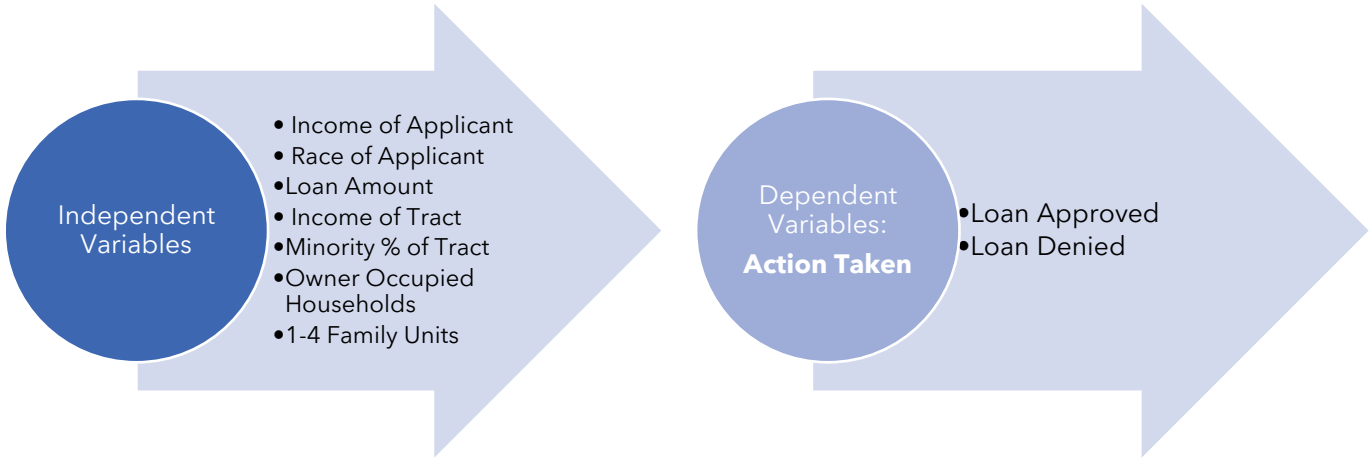
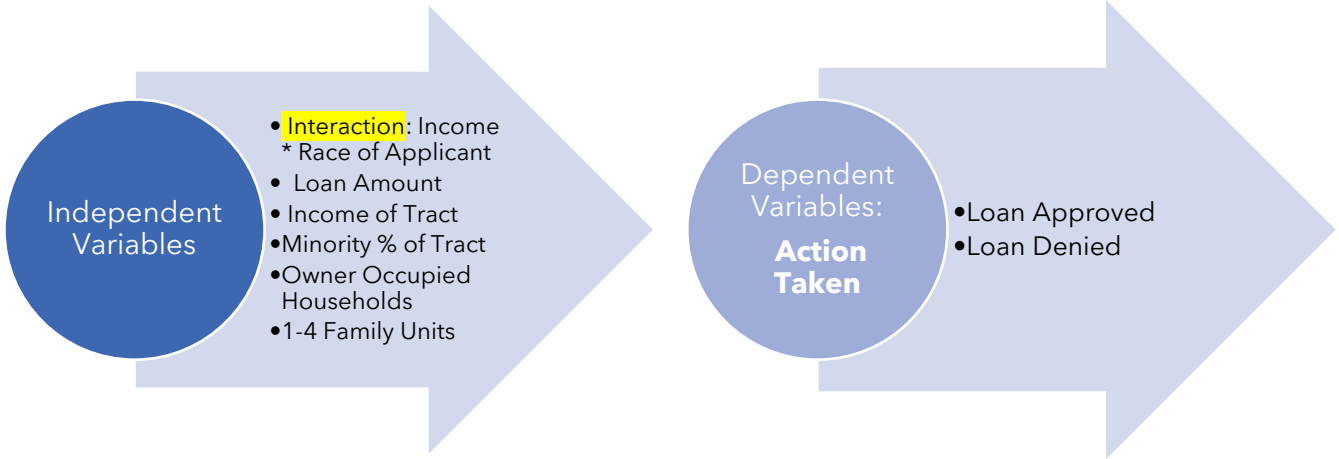


Figure 1b shows the same model, however, an interaction between income and race is included in the equation. Adding the interaction of race with income to the model will help indicate whether lenders evaluate different applicant characteristics (income) by racial group and therefore whether lenders differentiate their treatment by racial group.

Figure 1b: Logistic Regression **with Interaction**, Loan Decision



The second set of the multinomial logit regression is pictured in Figure 2a and 2b. In this model, the independent variables are the same but the dependent variables have changed from action taken by lender to reasons for denial. The reasons for denial choices include *no reason for denial*, *collateral*, *debt-to-income ratio*, *credit application incomplete*, *employment history*, *insufficient cash*, *unverifiable info*, and *other*. The dependent variable includes *no reason for denial* because among the choices for reason for denial, the most common one is *no reason for denial*. For that reason, *no reason for denial* will form the base. All other dependent variable choices will be compared to this base. Figure 2b includes an interaction between race and income.

Figure 2a: Multinomial Logit Regression, Reason for Denial as 10-way Choice

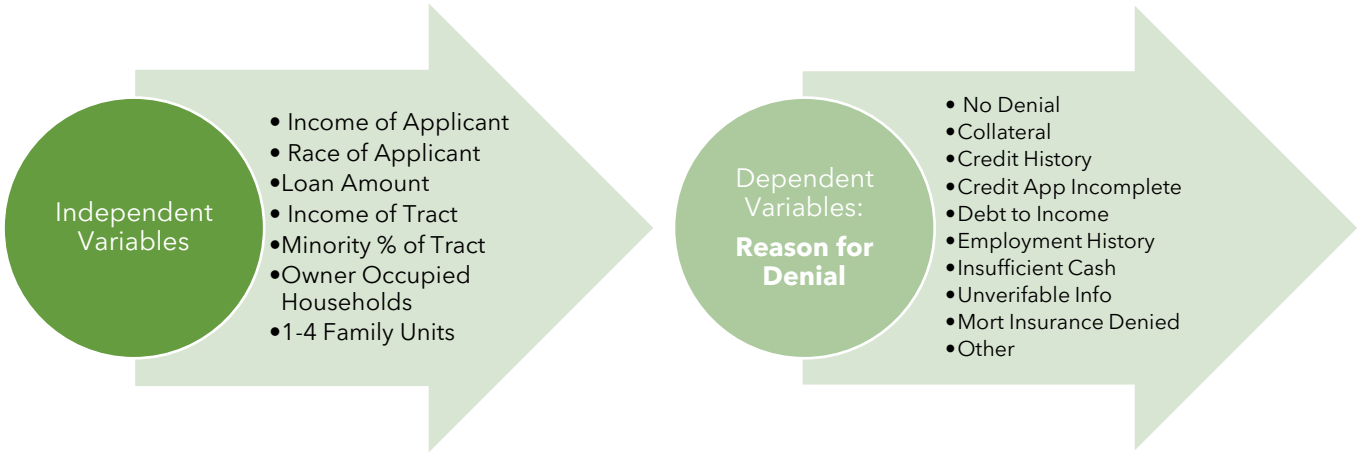
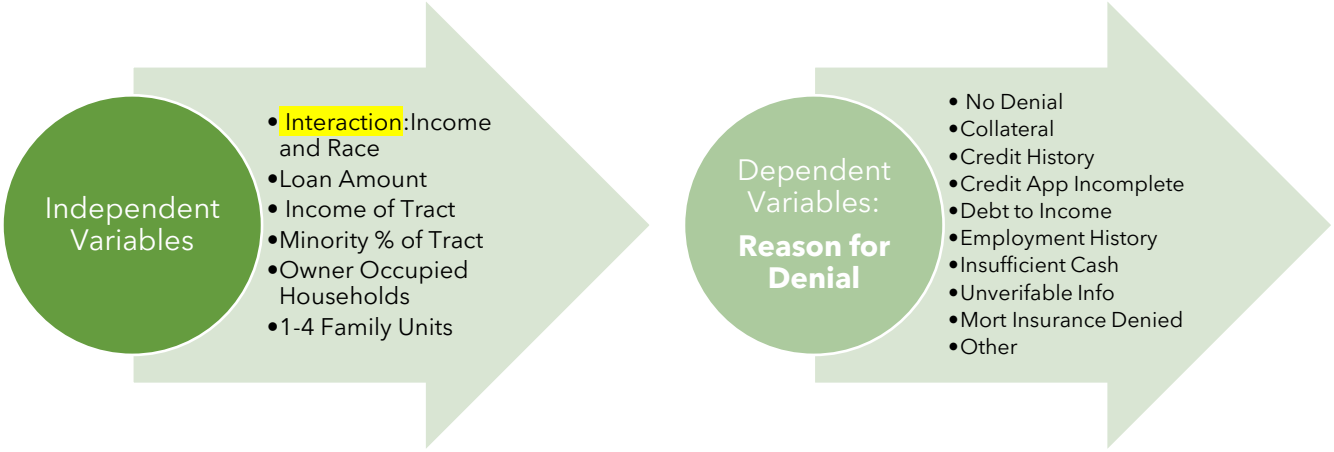


Figure 2b: Multinomial Logit Regression, Reason for Denial as 10-way Choice with Interaction



Results and Discussions

Trends over Time and Space

To better understand the context of the Atlanta mortgage market, the analysis begins with a study of homebuying trends over time and space. Figure 3 shows a dot density map of Black, white, and Hispanic home purchase loan approvals for owner-occupied, one-to-four family homes between 2012 and 2017. As mentioned previously, loan approvals or *Loans Approved* is defined as all loan application that were approved but not accepted, pre-approved, and originated. This data is presented over a gray-spectrum showing low (0-30 percent), medium (30-50 percent), and high (50-100 percent) average minority proportion of the census tract over the 2012 to 2017 period. Overall, white homebuyers are buying homes in predominately white census tracts above I-20 and in the exurbs of the metropolitan region. They are avoiding predominately minority or Black census tracts. Blacks are buying homes in predominately minority or Black census tracts below I-20 and in the 30-50 percent minority tracts in the northwest, southeast, and northeast parts of the MSA. Latino households are buying in census tracts with 30 percent and greater minority population largely in the northeast and some along the northwest part of the MSA.

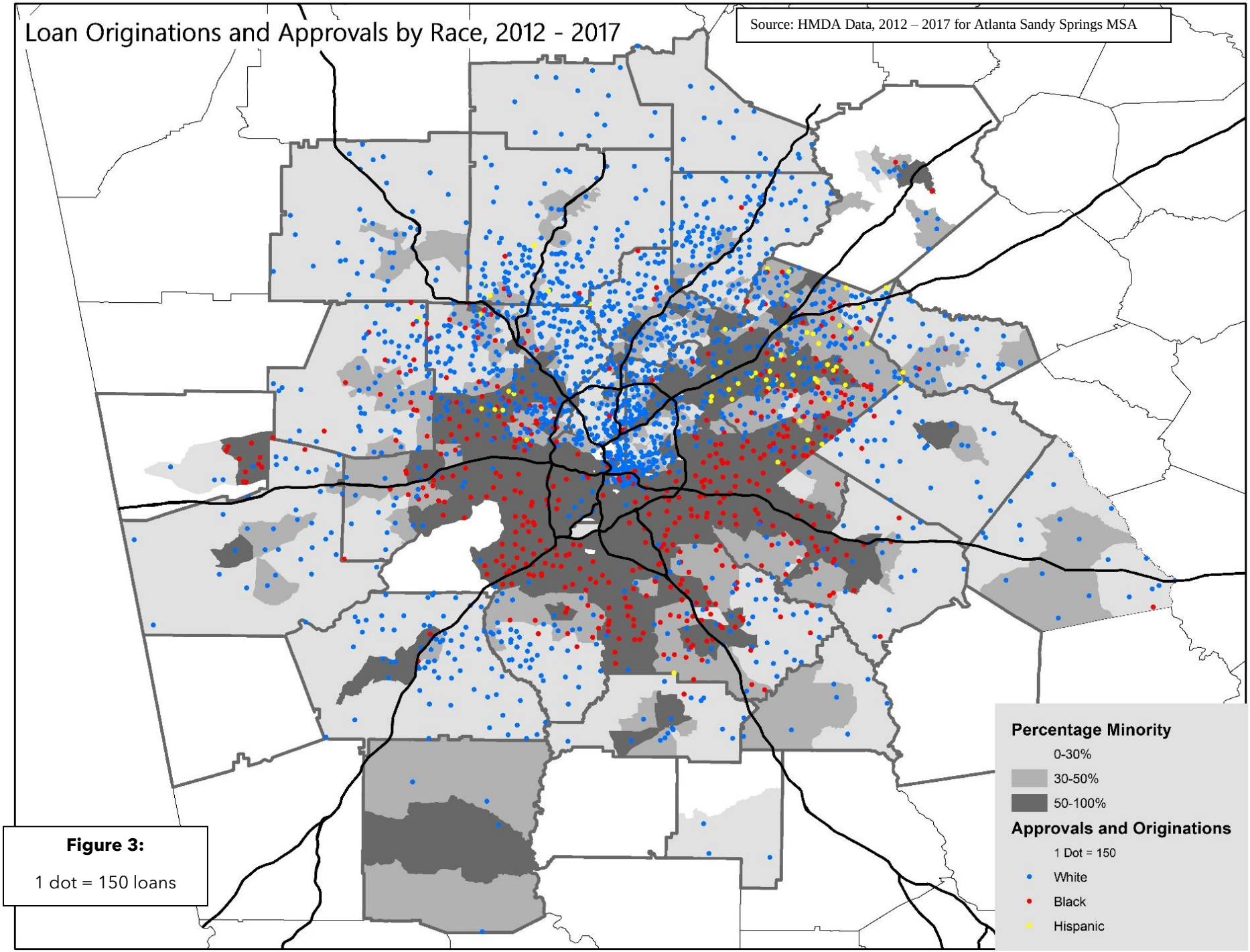
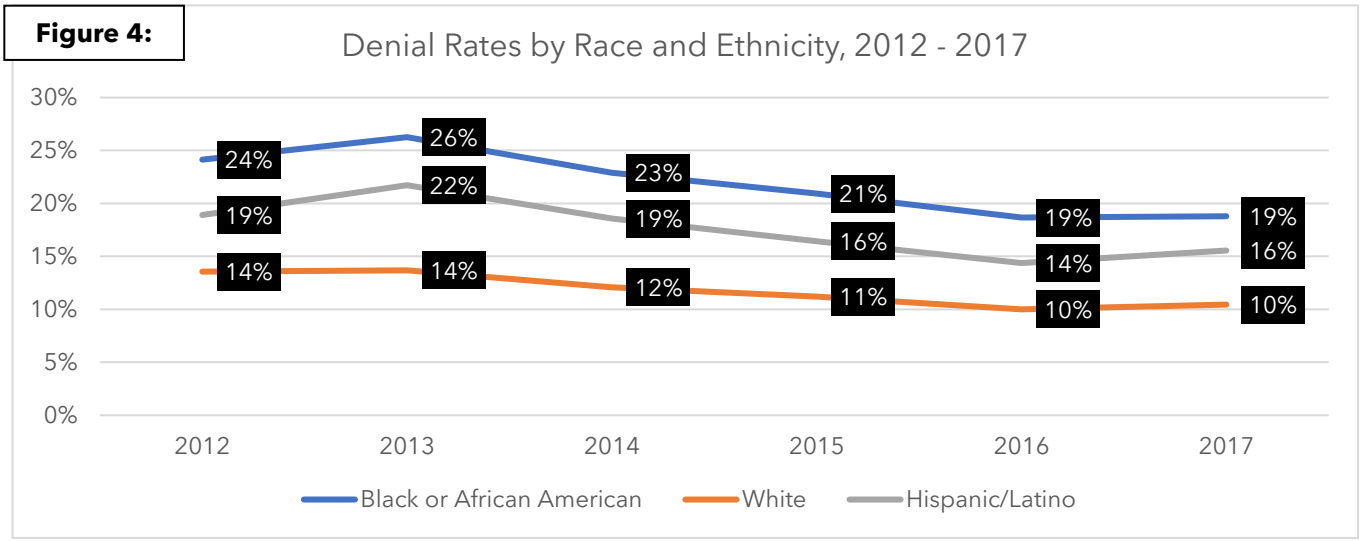


Figure 3:

1 dot = 150 loans

Figure 4:



Source: HMDA Data, 2012 – 2017 for Atlanta Sandy Springs MSA

Figure 4 shows that between 2012 and 2017 denial rates among Black, white, and Latino households have declined over the six years. Consistently, Black and Latino households have higher denial rates than white households

Racial spatial patterns of loans approvals and denials is shared for each year of the study period in Figures 5-7. Across all figures, one dot represents 20 home purchase loan applications and green dots represent denials. In Figure 5, blue dots show white loan approvals. Since 2012, the number of white loan approvals has nearly doubled by 2017. Most loan approvals among white borrowers have occurred in majority white census tracts. Lack of blue dots in majority minority tracts demonstrate avoidance of homebuying in those tracts. However, by 2017, white homebuying has trickled below 1-20 into majority Black census tracts. This pattern in homebuying is consistent with observed trends: "the arrival of white residents is now changing nonwhite communities…. affecting one in six predominately African American census tracts…with remarkable consistency across the country" (Badger, 2019). It is important to know that with the influx of white residents affecting one in six census tracts and the property value appreciation related to the BeltLine, the percent minority population grey overlay will likely look different in the latter years of this study period.

Figure 6 shares Black loan approvals as red dots. Since 2012, the number of loan approvals has more than doubled. Most loan approvals among Blacks occurs in predominately Black census tracts. This trend has remained consistent every year of the study period. In the last three years, 2015-17, Black loan approvals have increased in the exurbs in all directions of the metro region. This trend is consistent recent research: "as nonwhite city centers grow more white, white suburbs grow more diverse" (Badger, 2019).

Figure 7 shares Latino loan approvals as yellow dots. Like white and Black homebuying trends, loan approvals among Latino households are geographically concentrated within the metro region. In 2012, most loan approvals occurred in the north part of the region and neighboring exurbs. However, loan approvals among Latinos have been suburbanizing and increasing in the exurbs similar to Black loan approval trends.

Figure 5:

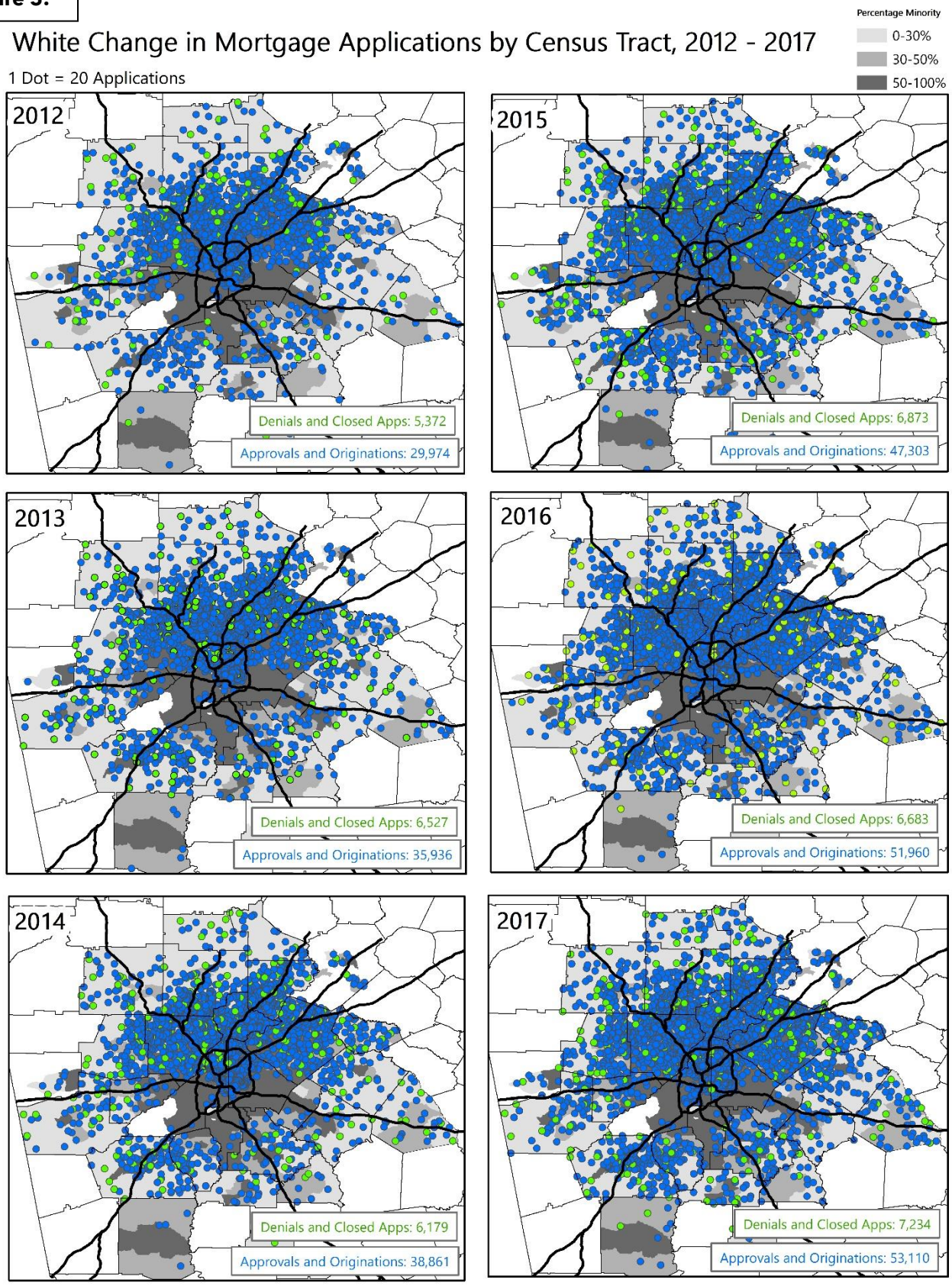

White Change in Mortgage Applications by Census Tract, 2012 - 2017
1 Dot = 20 Applications
Percentage Minority
0-30%
30-50%
50-100%
2012
Denials and Closed Apps: 5,372
Approvals and Originations: 29,974
2015
Denials and Closed Apps: 6,873
Approvals and Originations: 47,303
2013
Denials and Closed Apps: 6,527
Approvals and Originations: 35,936
2016
Denials and Closed Apps: 6,683
Approvals and Originations: 51,960
2014
Denials and Closed Apps: 6,179
Approvals and Originations: 38,861
2017
Denials and Closed Apps: 7,234
Approvals and Originations: 53,110

Figure 6:

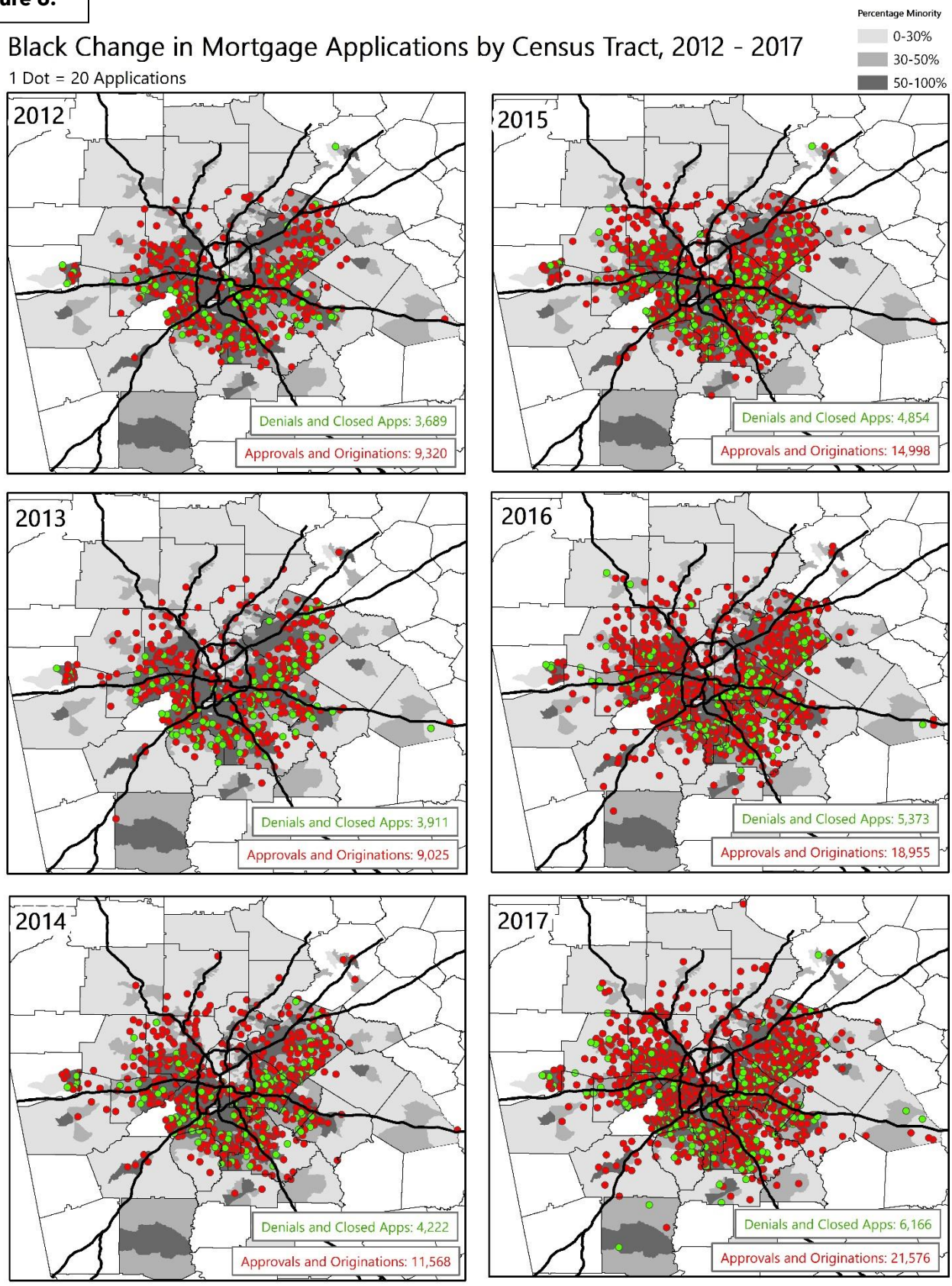
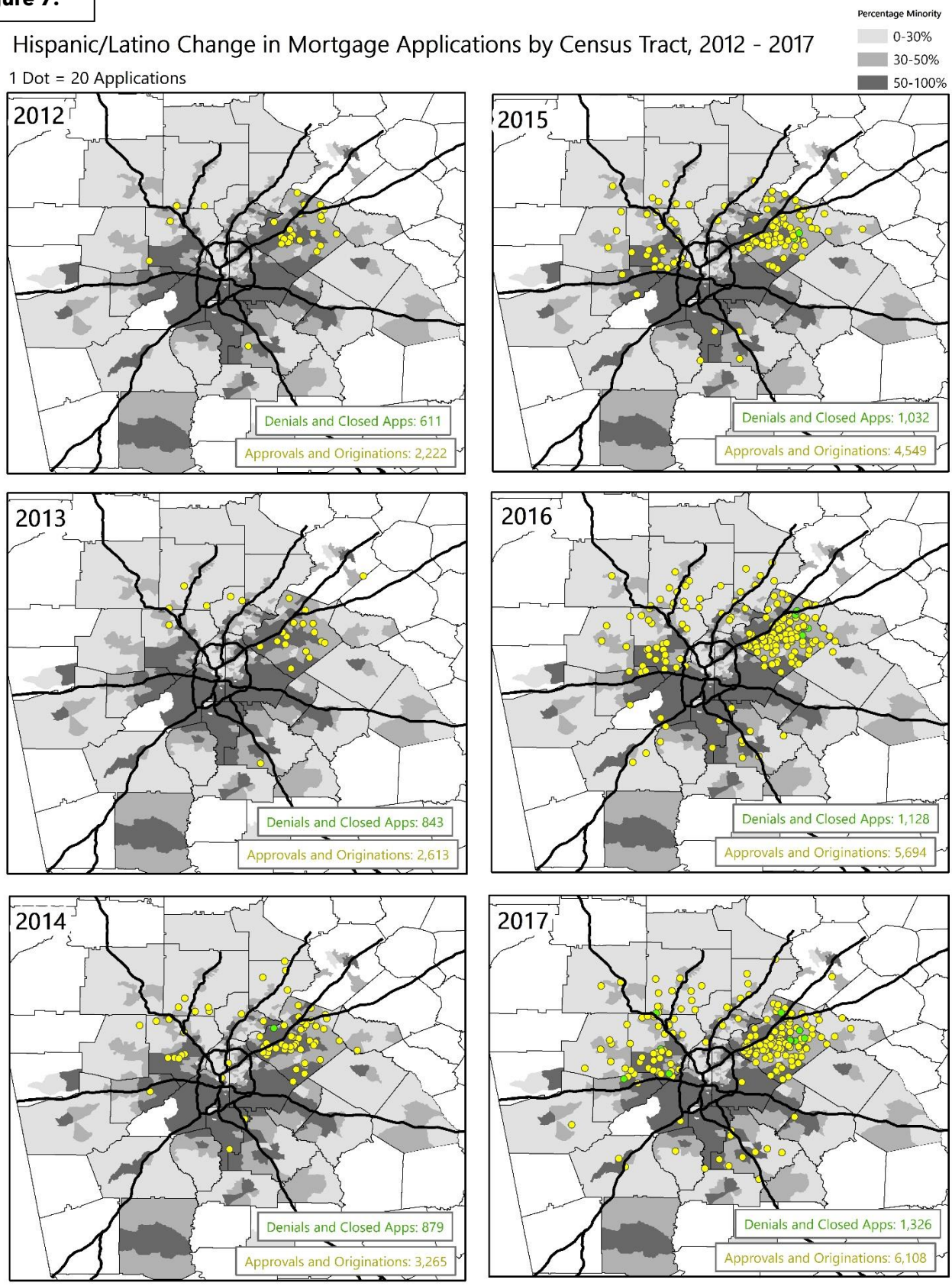

Black Change in Mortgage Applications by Census Tract, 2012 - 2017
1 Dot = 20 Applications
Percentage Minority
0-30%
30-50%
50-100%
2012
Denials and Closed Apps: 3,689
Approvals and Originations: 9,320
2015
Denials and Closed Apps: 4,854
Approvals and Originations: 14,998
2013
Denials and Closed Apps: 3,911
Approvals and Originations: 9,025
2016
Denials and Closed Apps: 5,373
Approvals and Originations: 18,955
2014
Denials and Closed Apps: 4,222
Approvals and Originations: 11,568
2017
Denials and Closed Apps: 6,166
Approvals and Originations: 21,576

Figure 7:


Hispanic/Latino Change in Mortgage Applications by Census Tract, 2012 - 2017
1 Dot = 20 Applications
Percentage Minority
0-30%
30-50%
50-100%
2012
Denials and Closed Apps: 611
Approvals and Originations: 2,222
2015
Denials and Closed Apps: 1,032
Approvals and Originations: 4,549
2013
Denials and Closed Apps: 843
Approvals and Originations: 2,613
2016
Denials and Closed Apps: 1,128
Approvals and Originations: 5,694
2014
Denials and Closed Apps: 879
Approvals and Originations: 3,265
2017
Denials and Closed Apps: 1,326
Approvals and Originations: 6,108

Results

The results for regression model found in Figure 1a can be seen in Table 2. Here, *Applicant Income* equals the annual salary of the applicant and *Tract Income* equals the average income of the census tract. *Minority* represents the percent minority of the census tract. Black represents a dummy variable and takes on the value of 1 if the applicant is Black and the value of 0 if the applicant is not Black. Latino and White similarly represent dummy variables, representing 1 if the applicant is Latino or white and 0 if they are not.

The independent variables for the regression for Black applicants include Black, white, minority, applicant income, and tenant income (Tract Income) and the dependent variable, action taken, takes on a two way choice of *Loan Approved* (0) or *Loan Denied* (1) of loan application. Loans Approved are not shared as they represent the base for the logistic regression.

Table 2: Logistical Regression, Loan Decision (refers to Figure 1a) with Odds Ratios

	Coefficient	Std Err.	z	P>|z|	Odd Ratio	Odds (%)
Latino	0.323	0.016	20.160	0.000	1.381	38.1%
White	-0.314	0.015	-20.950	0.000	0.730	-27.0%
Black	0.366	0.016	23.350	0.000	1.442	44.2%
Loan	-0.001	0.000	-9.720	0.000	0.999	-0.1%
Applicant Income	-0.001	0.000	-4.460	0.000	0.999	-0.1%
Minority	0.001	0.000	5.360	0.000	1.001	0.1%
Tract Income	-0.002	0.000	-10.370	0.000	0.998	-0.2%
Owner-Occupied Households	0.000	0.000	-9.760	0.000	1.000	0.0%
1-4 Family Units	0.000	0.000	8.760	0.000	1.000	0.0%
Constant	-1.215	0.028	-43.640	0.000	0.297	-70.3%

The odds ratio found in Table 2 provides a concrete number to interpret. According to the odds ratio for Blacks, being Black multiples the odds of being denied rather than approved by 1.44. Another way to interpret the odds ratio is by interpreting it as probability: being Black increases the odds of denial by 44.2 percent. Examining the odds ratio for white, the results show that being white multiples the odds of being denied rather than approved by 0.73. Another way, being white decreases the odds of denial by 27 percent. The results for Latinos show that being Latino multiplies the odds of being denied rather than approved by 1.38. Being Latino increases the odds of denial by 38.1 percent. According to the first model of the regression, Blacks and Latinos are more likely to be denied for a loan.

The model for the logistic regression refers to Figure 1b and the results can be found in Table 3 on the following page. An interaction between race and applicant income was introduced to the model. The purpose of the interaction is to determine if there is a relationship between race and income in the mortgage decision-making process. If there is a relationship, it may uncover if there is a differential treatment by lenders based on race controlling for census tract average income, minority population, owner-occupied households and 1-4 family units. According to the results for this regression, the interaction variable of white and income was not significant. However, the interaction variable was significant for Latinos and Blacks. This means that the effect of the continuous predictor, income, depends on the level of categorical predictor, Latino or Black. For Latino applicants, the odds ratio is 0.998 for a one-unit increase or $1,000 change in income and the odds ratio for Black applicants is 0.999

for a $1,000 change in income. In other words, for every $1,000 increase in income, being Latino or Black decreases the odds of denial by 0.2 percent and 0.1 percent, respectively.

Table 3: Logistical Regression with Interaction, Loan Decision (refers to Figure 1b) with Odds ratios

Action by Lender	Coefficient	Std Err.	z	P>|z|	Odd Ratio	Odds (%)
Latino	0.438	0.040	10.930	0.000	1.549	0.549
Interaction: Latino and Applicant Income	-0.002	0.001	-2.860	0.004	0.998	-0.002
White	-0.313	0.030	-10.570	0.000	0.731	-0.269
Interaction: White and Applicant Income	0.000	0.000	-0.210	0.835	1.000	0.000
Black	0.451	0.036	12.510	0.000	1.570	0.570
Interaction: Black and Applicant Income	-0.001	0.000	-2.670	0.008	0.999	-0.001
Loan	-0.001	0.000	-9.390	0.000	0.999	-0.001
Applicant Income	0.000	0.000	-1.600	0.109	1.000	0.000
Minority	0.001	0.000	4.350	0.000	1.001	0.001
Tract Income	-0.002	0.000	-10.730	0.000	0.998	-0.002
Owner-Occupied Households	0.000	0.000	-9.470	0.000	1.000	0.000
1-4 Family Units	0.000	0.000	8.510	0.000	1.000	0.000
Constant	-1.230	0.035	-34.910	0.000	0.292	-0.708

Table 4 follows the multinomial regression model found in Figure 2a. The same independent variables will be used in a regression with outcomes that are reasons for denial. The reference point or basis for the outcome is that the loan is originated. Outcomes numbered 1-9 indicate the reasons for denial. Each reason for denial is listed left to right with the coefficients, odds ratios, standard deviation, and p-values. The highlighted odds ratios pertain to the variables that have p-values that are statistically significant in a 90 or 95 percent confidence interval. The regression includes the independent variables: Race, Applicant Income, Tract Income, Percent Minority, Loan Amount, number of Owner Occupied Households, and number of 1-4 Family units and places them into an equation with the 9 possible reasons for denial.

For Blacks, debt to income, credit history, credit application incomplete, collateral, and other are statistically significant reasons for denial. Examining the odds ratio, it can be observed that

- Being Black multiples the odds of being denied for *debt-to-income ratio* rather than being approved by 1.38. Another way to interpret this number: being Black increases the odds of denial due to *debt to income ratio* by 38 percent.
- Being Black multiplies the odds of being denied for *credit history* rather than being approved by 2.57. Another way: being Black increases the odds of denial due to *credit history* by 157 percent.
- Being Black multiples the odds of being denied for an *incomplete credit application* rather than being approved by 1.32 or increases the odds of denial due to *incomplete credit application* by 32 percent.
- Being Black multiplies the odds of being denied for *collateral* rather than being approved by 1.47 or increases the odds of denial for this reason by 47 percent.

Table 4: Multinomial Logit Regression, Reason for Denial as 10-way Choice with Odds Ratios; Base = loan is originated (0) (refers to Figure 2a)

. mlogit Denial2 i.Latino i.Black i.White Loan A_Income Minority T_Income OwnOcc > Units, robust

	(1) Debt to Income Ratio					(2) Employment History					(3) Credit History				
	Coefficient	Std Err.	P>|z|	Odd Ratio	Odds %	Coefficient	Std Err.	P>|z|	Odd Ratio	Odds %	Coefficient	Std Err.	P>|z|	Odd Ratio	Odds %
Latino	0.18	0.04	0.00	1.20	20%	0.44	0.10	0.00	1.55	55%	0.07	0.05	0.12	1.08	8%
White	-0.35	0.03	0.00	0.71	-29%	-0.44	0.10	0.00	0.64	-36%	0.12	0.05	0.02	1.12	12%
Black	0.33	0.04	0.00	1.38	38%	-0.12	0.10	0.24	0.89	-11%	0.95	0.05	0.00	2.57	157%
Loan	0.01	0.00	0.00	1.01	1%	0.00	0.00	0.27	1.00	0%	0.00	0.00	0.00	1.00	0%
Applicant Income	-0.03	0.00	0.00	0.98	-2%	-0.01	0.00	0.01	0.99	-1%	0.00	0.00	0.00	1.00	0%
Minority	0.00	0.00	0.00	1.00	0%	0.00	0.00	0.20	1.00	0%	0.00	0.00	0.00	1.00	0%
Tract Income	0.00	0.00	0.27	1.00	0%	0.00	0.00	0.52	1.00	0%	0.00	0.00	0.00	1.00	0%
Owner-Occupied HHs	0.00	0.00	0.00	1.00	0%	0.00	0.00	0.10	1.00	0%	0.00	0.00	0.32	1.00	0%
1-4 Family Units	0.00	0.00	0.00	1.00	0%	0.00	0.00	0.12	1.00	0%	0.00	0.00	0.25	1.00	0%
Constant	-3.06	0.07	0.00	0.05	-95%	-4.85	0.19	0.00	0.01	-99%	-3.23	0.08	0.00	0.04	-96%

	(4) Collateral					(5) Insufficient Cash					(6) Unverifiable Info				
	Coefficient	Std Err.	P>|z|	Odd Ratio	Odds %	Coefficient	Std Err.	P>|z|	Odd Ratio	Odds %	Coefficient	Std Err.	P>|z|	Odd Ratio	Odds %
Latino	-0.04	0.05	0.36	0.96	-4%	0.30	0.09	0.00	1.35	35%	0.57	0.07	0.00	1.76	76%
White	0.27	0.05	0.00	1.31	31%	-0.33	0.08	0.00	0.72	-28%	-0.69	0.06	0.00	0.50	-50%
Black	0.38	0.05	0.00	1.47	47%	0.11	0.08	0.18	1.12	12%	-0.16	0.07	0.02	0.85	-15%
Loan	0.00	0.00	0.00	1.00	0%	0.00	0.00	0.46	1.00	0%	0.00	0.00	0.08	1.00	0%
Applicant Income	0.00	0.00	0.00	1.00	0%	0.00	0.00	0.20	1.00	0%	0.00	0.00	0.36	1.00	0%
Minority	0.01	0.00	0.00	1.01	1%	0.01	0.00	0.00	1.01	1%	0.01	0.00	0.00	1.01	1%
Tract Income	0.00	0.00	0.33	1.00	0%	0.00	0.00	0.38	1.00	0%	0.00	0.00	0.63	1.00	0%
Owner-Occupied HHs	0.00	0.00	0.44	1.00	0%	0.00	0.00	0.60	1.00	0%	0.00	0.00	0.43	1.00	0%
1-4 Family Units	0.00	0.00	0.00	1.00	0%	0.00	0.00	0.68	1.00	0%	0.00	0.00	0.40	1.00	0%
Constant	-3.99	0.08	0.00	0.02	-98%	-5.24	0.15	0.00	0.01	-99%	-4.91	0.12	0.00	0.01	-99%

	(7) Credit App Incomplete					(8) Mortgage Insurance Denied					(9) Other				
	Coefficient	Std Err.	P>|z|	Odd Ratio	Odds %	Coefficient	Std Err.	P>|z|	Odd Ratio	Odds %	Coefficient	Std Err.	P>|z|	Odd Ratio	Odds %
Latino	0.00	0.07	0.98	1.00	0%	0.05	0.48	0.91	1.05	5%	0.36	0.07	0.00	1.43	43%
White	-0.10	0.05	0.06	0.90	-10%	0.16	0.48	0.74	1.17	17%	-0.36	0.06	0.00	0.70	-30%
Black	0.28	0.06	0.00	1.32	32%	0.44	0.51	0.38	1.56	56%	0.20	0.07	0.00	1.22	22%
Loan	0.00	0.00	0.02	1.00	0%	0.00	0.00	0.00	1.00	0%	0.00	0.00	0.00	1.00	0%
Applicant Income	0.00	0.00	0.00	1.00	0%	0.00	0.00	0.00	1.00	0%	0.00	0.00	0.00	1.00	0%
Minority	0.01	0.00	0.00	1.01	1%	-0.01	0.01	0.39	0.99	-1%	0.00	0.00	0.00	1.00	0%
Tract Income	0.00	0.00	0.00	1.00	0%	0.01	0.01	0.31	1.01	1%	0.00	0.00	0.23	1.00	0%
Owner-Occupied HHs	0.00	0.00	0.01	1.00	0%	0.00	0.00	0.39	1.00	0%	0.00	0.00	0.80	1.00	0%
1-4 Family Units	0.00	0.00	0.00	1.00	0%	0.00	0.00	0.28	1.00	0%	0.00	0.00	0.35	1.00	0%
Constant	-4.97	0.09	0.00	0.01	-99%	-7.98	0.79	0.00	0.00	-100%	-4.42	0.12	0.00	0.01	-99%

For Latinos, debt-to-income ratio, employment history, insufficient cash, unverifiable information, credit application incomplete, and other are statistically significant reasons for denial.

- Being Latino multiplies the odds of being denied for *debt-to-income ratio* rather than being approved by 1.20 or increases the odds of denial due to *debt-to-income ratio* by 20 percent.
- Being Latino multiplies the odds of being denied for *employment history* rather than being approved by 1.55 or increases the odds of denial due to *employment history* by 55 percent.
- Being Latino also multiplies the odds of being denied for *insufficient funds* rather than being approved by 1.35 or increases the odds of denial due to *insufficient funds* by 35 percent.
- Being Latino also multiplies the odds of being denied for *unverifiable information* rather than being approved by 1.75 or increases the odds of denial due to *unverifiable information* by 75 percent. The odds of denial for this reason are larger than for whites and Blacks. In fact, being white or Black decreases the odds of denial for this reason.

For whites, debt-to-income ratio, employment history, credit history, insufficient cash, unverifiable information, incomplete credit application and other are statistically significant reasons for denial.

- Being white multiplies the odds of being denied for *debt-to-income ratio* rather than approved by .71 or decreases the odds of denial due to *debt-to-income ratio* by 29 percent.
- Being white multiplies the odds of being denied due to *employment history* rather than approved by 0.64 or decreases the odds of denial for this reason by 36 percent.
- Being white multiplies the odds of denial for *insufficient funds* rather than approved by 0.72 or decreases the odds of denial by 28 percent for this reason.
- Being white multiplies the odds of being denied for *incomplete credit application* rather than approved by 0.90 or decreases the odds of denial for this reason by 10 percent.
- Being white multiplies the odds of being denied due to *credit history* rather than approved by 1.12 or increases the odds of denial for this reason by 12 percent.
- Being white also multiples the odds of being denied due to *collateral* rather than approved by 1.31 or increases the odds by 31 percent.

Across the statistically significant reasons for denial, whites have reduced odds of denial while Blacks and Latinos have consistently higher odds of denial. The results from this regression demonstrate the importance of finding ways to address the reasons for denial among Blacks and Latinos including debt-to-income ratio, credit history, insufficient funds, and employment history. In addition, with the category 'other' being significant across whites, Blacks, and Latinos, it is important to investigate the lending process to ensure all reasons for denial are uncovered and systematically included.

Table 5 follows the multinomial regression model found in Figure 2b. This regression introduces the interaction variable, income * race. For Blacks, the interaction term of Black * income is statistically significant for employment history and insufficient funds. This means that the effect of the continuous predictor, income, depends on the level of the categorical predictor, Black, for these reasons for denial.

- For Black applicants, the odds ratio for *employment history* is 1.007 for a $1,000 increase in income. In other words, for every $1,000 increase in income, being Black increases the odds of denial for *employment history* of 0.7 percent.
- For Black applicants, the odds ratio for *insufficient funds* is 0.996 for a $1,000 increase in income. For every $1,000 increase in income, being Black decreases the odds of denial for *insufficient funds* of 0.4 percent.

Table 5: Multinomial Logit Reg, Reason for Denial-10-way Choice, Odds Ratios & Interaction (refers to Figure 2b)

	(1) Debt to Income Ratio					(2) Employment History					(3) Credit History				
	Coefficient	Std Err.	P>|z|	Odd Ratio	Odds %	Coefficient	Std Err.	P>|z|	Odd Ratio	Odds %	Coefficient	Std Err.	P>|z|	Odd Ratio	Odds %
Latino	0.480	0.117	0.000	1.616	0.616	1.018	0.284	0.000	2.767	1.767	-0.007	0.053	0.901	0.993	-0.007
Interaction: Latino & Applicant Income	-0.005	0.002	0.028	0.995	-0.005	-0.014	0.006	0.024	0.986	-0.014	0.001	0.000	0.002	1.001	0.001
White	-0.782	0.108	0.000	0.457	-0.543	-0.318	0.226	0.158	0.727	-0.273	0.178	0.062	0.004	1.195	0.195
Interaction: White & Applicant Income	0.006	0.002	0.000	1.006	0.006	-0.002	0.003	0.571	0.998	-0.002	-0.001	0.000	0.088	0.999	-0.001
Black	0.265	0.107	0.014	1.303	0.303	-0.562	0.235	0.017	0.570	-0.430	0.971	0.064	0.000	2.642	1.642
Interaction: Black & Applicant Income	0.000	0.002	0.792	1.000	0.000	0.007	0.003	0.020	1.007	0.007	0.000	0.000	0.556	1.000	0.000
Loan	0.006	0.000	0.000	1.006	0.006	-0.001	0.001	0.171	0.999	-0.001	-0.004	0.000	0.000	0.996	-0.004
Applicant Income	-0.029	0.002	0.000	0.972	-0.028	-0.007	0.003	0.012	0.993	-0.007	0.001	0.000	0.001	1.001	0.001
Minority	0.002	0.001	0.001	1.002	0.002	0.002	0.001	0.099	1.002	0.002	-0.003	0.001	0.000	0.997	-0.003
Tract Income	0.000	0.001	0.612	1.000	0.000	0.000	0.002	0.841	1.000	0.000	-0.004	0.001	0.000	0.996	-0.004
Owner-Occupied HHs	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.127	1.000	0.000	0.000	0.000	0.316	1.000	0.000
1-4 Family Units	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.143	1.000	0.000	0.000	0.000	0.252	1.000	0.000
Constant	-2.763	0.108	0.000	0.063	-0.937	-4.880	0.249	0.000	0.008	-0.992	-3.275	0.090	0.000	0.038	-0.962

	(4) Collateral					(5) Insufficient Cash					(6) Unverifiable Info				
	Coefficient	Std Err.	P>|z|	Odd Ratio	Odds %	Coefficient	Std Err.	P>|z|	Odd Ratio	Odds %	Coefficient	Std Err.	P>|z|	Odd Ratio	Odds %
Latino	-0.026	0.069	0.708	0.974	-0.026	0.457	0.177	0.010	1.580	0.580	0.561	0.183	0.002	1.753	0.753
Interaction: Latino & Applicant Income	0.000	0.001	0.830	1.000	0.000	-0.002	0.003	0.397	0.998	-0.002	0.000	0.002	0.976	1.000	0.000
White	0.147	0.076	0.054	1.159	0.159	-0.342	0.125	0.006	0.710	-0.290	-0.657	0.123	0.000	0.518	-0.482
Interaction: White & Applicant Income	0.001	0.001	0.057	1.001	0.001	0.000	0.001	0.953	1.000	0.000	0.000	0.001	0.779	1.000	0.000
Black	0.282	0.078	0.000	1.326	0.326	0.382	0.152	0.012	1.466	0.466	-0.103	0.120	0.389	0.902	-0.098
Interaction: Black & Applicant Income	0.001	0.001	0.119	1.001	0.001	-0.004	0.002	0.026	0.996	-0.004	-0.001	0.001	0.541	0.999	-0.001
Loan	-0.001	0.000	0.000	0.999	-0.001	0.000	0.000	0.610	1.000	0.000	0.000	0.000	0.080	1.000	0.000
Applicant Income	-0.001	0.001	0.320	0.999	-0.001	0.000	0.001	0.772	1.000	0.000	0.000	0.001	0.974	1.000	0.000
Minority	0.009	0.001	0.000	1.009	0.009	0.005	0.001	0.000	1.005	0.005	0.005	0.001	0.000	1.005	0.005
Tract Income	-0.001	0.001	0.342	0.999	-0.001	-0.001	0.001	0.261	0.999	-0.001	0.000	0.001	0.607	1.000	0.000
Owner-Occupied HHs	0.000	0.000	0.448	1.000	0.000	0.000	0.000	0.732	1.000	0.000	0.000	0.000	0.414	1.000	0.000
1-4 Family Units	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.790	1.000	0.000	0.000	0.000	0.386	1.000	0.000
Constant	-3.873	0.096	0.000	0.021	-0.979	-5.247	0.173	0.000	0.005	-0.995	-4.939	0.148	0.000	0.007	-0.993

	(7) Credit App Incomplete					(8) Mortgage Insurance Denied					(9) Other				
	Coefficient	Std Err.	P>|z|	Odd Ratio	Odds %	Coefficient	Std Err.	P>|z|	Odd Ratio	Odds %	Coefficient	Std Err.	P>|z|	Odd Ratio	Odds %
Latino	-0.108	0.074	0.144	0.898	-0.102	-0.386	0.507	0.446	0.680	-0.320	0.422	0.098	0.000	1.525	0.525
Interaction: Latino & Applicant Income	0.001	0.000	0.001	1.001	0.001	0.005	0.002	0.005	1.005	0.005	-0.001	0.001	0.385	0.999	-0.001
White	-0.098	0.068	0.148	0.907	-0.093	0.169	0.494	0.732	1.184	0.184	-0.290	0.068	0.000	0.749	-0.251
Interaction: White & Applicant Income	0.000	0.000	0.973	1.000	0.000	0.000	0.001	0.853	1.000	0.000	-0.001	0.000	0.017	0.999	-0.001
Black	0.283	0.072	0.000	1.327	0.327	0.323	0.517	0.531	1.382	0.382	0.254	0.072	0.000	1.289	0.289
Interaction: Black & Applicant Income	0.000	0.000	0.816	1.000	0.000	0.002	0.002	0.400	1.002	0.002	-0.001	0.000	0.121	0.999	-0.001
Loan	0.000	0.000	0.022	1.000	0.000	-0.005	0.001	0.000	0.995	-0.005	-0.001	0.000	0.000	0.999	-0.001
Applicant Income	0.000	0.000	0.484	1.000	0.000	-0.001	0.002	0.583	0.999	-0.001	0.001	0.000	0.000	1.001	0.001
Minority	0.006	0.001	0.000	1.006	0.006	-0.005	0.006	0.430	0.995	-0.005	0.003	0.001	0.002	1.003	0.003
Tract Income	0.002	0.001	0.000	1.002	0.002	0.006	0.005	0.266	1.006	0.006	-0.001	0.001	0.243	0.999	-0.001
Owner-Occupied HHs	0.000	0.000	0.006	1.000	0.000	0.000	0.000	0.413	1.000	0.000	0.000	0.000	0.805	1.000	0.000
1-4 Family Units	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.289	1.000	0.000	0.000	0.000	0.350	1.000	0.000
Constant	-4.967	0.099	0.000	0.007	-0.993	-7.948	0.793	0.000	0.000	-1.000	-4.482	0.122	0.000	0.011	-0.989

For Latino applicants, the interaction term of Latino * income is significant for employment history, debt-to-income ratio, credit history, and credit application incomplete. This means that the effect of the continuous predictor, income, depends on the level of the categorical predictor, Latino, for these reasons for denial.

- For Latino applicants, the odds ratio for *debt-to-income ratio* is 0.995 for a one-unit increase or $1,000 increase to income. For every $1,000 increase in income, being Latino decreases the odds of denial for *debt-to-income ratio* by 0.5 percent.
- For Latino applicants, the odds ratio for *employment history* is 0.986 for a one-unit increase or $1,000 increase to income. For every $1,000 increase in income, being Latino decreases the odds of denial for *employment history* by 1.4 percent.

- For Latino applicants, the odds ratio for *credit history* is 1.001 for a one-unit increase or $1,000 increase to income. For every $1,000 increase in income, being Latino increases the odds of denial for *credit history* by 0.1 percent.
- For Latino applicants, the odds ratio for *credit application incomplete* is 1.001 for a one-unit increase or $1,000 increase to income. For every $1,000 increase in income, being Latino increases the odds of denial for *credit application incomplete* by 0.1 percent.

For white applicants, the interaction term of white * income is significant for debt-to-income ratio, collateral, and other. This means that the effect of the continuous predictor, income, depends on the level of the categorical predictor, white, for these reasons for denial.

- For white applicants, the odds ratio for *debt-to-income ratio* is 1.006 for a one-unit increase or $1,000 increase to income. For every $1,000 increase in income, being white increases the odds of denial for *debt-to-income ratio* by 0.6 percent.
- For white applicants, the odds ratio for *collateral* is 1.001 for a one-unit increase or $1,000 increase to income. For every $1,000 increase in income, being white increases the odds of denial for *collateral* by 0.1 percent.

Discussion

The results of this analysis show that there are differences in denial rates by race and ethnicity. This finding is important; however, it does not provide specific information about the causes behind the denial rates. The second set of regressions provides more insight into denial rates by sharing the relationship between race and the reasons for denial as reported by lenders for HMDA data.

Among Black applicants, credit history, debt to income ratio, credit application incomplete, and insufficient cash are statistically significant reasons for denial for a home mortgage. Among Latino or Hispanic applicants, debt-to-income ratio, insufficient cash, and employment history are statistically significant reasons for denial of a home mortgage. These results present fertile ground for policy change that can increase credit access to homeownership for Black and Latino households.

One modification that can increase credit to Black and Latino households is increasing the debt-to-income ratio threshold. In 2017, Fannie Mae altered mortgage underwriting standards announcing that they would consider debt-to-income (DTI) ratios of up to 50 percent. The prior limit had been 45 percent. As a result of the change, an estimated 95,000 new loans would be approved annually (Urban Institute, 2017). In addition, most of these loans "will likely be to Black and Latino families, as these families are approximately 1.5 times more likely to have DTI ratio above 45 percent" (Urban Institute, 2017).

In addition, without change to loan processes, the eradication of student loan debt will allow for more Black millennials to attain homeownership. By reducing their debt commitments, Black millennials would have better DTI ratios and can more effectively use their income toward down payments and homeownership costs.

Fannie Mae and Freddie Mac have both taken initiatives targeted at increasing access to mortgages for borrower-constrained households that are unable to make down payments for home mortgages. Home Ready (Fannie Mae) and Home Possible (Freddie Mac) allow for down payments for as low as 3 percent

(Acolin, 2019). These programs rival FHA's low down-payment loans, which tend to be expensive as a result of higher upfront costs and ongoing mortgage insurance premiums. Fannie and Freddie's programs specifically target low and moderate income borrowers and households in underserved areas. Since these programs were launched in 2018 and the time period for this research is 2012 – 2017, new research is required to determine if these low-downpayment programs contribute to reducing the odds of denial among Black and Latino households as a result of insufficient funds. However, the reduced down payment requirements of these programs address the barrier of limited savings for down payment among Black households, half of which are first time home buyers and a majority of which have few resources for these costs (Shapiro, Meschede, and Osoro, 2013).

An untapped opportunity to increase access to credit for Black and Latino households is to relax and restructure the requirements for credit history. Freddie Mac and Fannie Mae's programs target credit worthy households with scores above 660 or 680, with only a small set of borrowers approved at scores between 620 and 660. Moreover, there have been few, if any, state and federal efforts to address the damage to Black credit scores brought about by the 2007 subprime lending crisis. From the results of this analysis, recall that being Black in the Atlanta increases the odds of denial due to credit history by 110 percent. The aftermath of the crisis and the results of this analysis are hardly coincidence. There is a relationship between being Black and being denied for a mortgage because of credit history. For this reason, it is important that policy and practice address the negative impact of the crisis on Black credit scores. Efforts to expunge and remove credit damage as a result of the crisis are necessary to repairing the gap in denial rates among Blacks and whites.

A strategy that GSEs are using to insure loans for borrowers that do not use traditional credit or do not have credit scores is assessing the repayment of household items to determine creditworthiness. These include measuring repayment of rent, telecom, and utility payments (Acolin, 2019). Applying this strategy to households negatively impacted by the subprime lending crisis would offer a congruent method of assessing creditworthiness while increasing access to credit.

Conclusion

The purpose of this research is to examine mortgage lending patterns and determine if Black and Hispanic applicants are more likely to be denied for a loan than white applicants. This analysis also had the goal of identifying specific reasons for denial faced by Black and Hispanic applicants in the mortgage market.

The results of the study show that in Metro Atlanta between 2012 – 2017, Black and Latino households are more likely than white households to be denied for a loan. Being Black increases the odds for denial by 44 percent and being Latino increases the odds of denial by 38 percent. Being white, in contrast, decreases the odds of denial by 27 percent.

Including reasons for denial in the analysis provided more specificity about the causes for denial. A multinomial logit regression analysis found that being Black increases the odds of denial due to debt to income ratio by 38 percent, credit history by 157 percent, incomplete credit application by 32 percent, and collateral by 47 percent. Being Latino increases the odds of denial due to debt to income ratio by 20 percent, employment history by 55 percent, insufficient funds by 35 percent, and unverifiable information by 75 percent. In contrast, being white decreases the odds of denial due to debt-to-income ratio by 29 percent, employment history by 36 percent, insufficient funds by 28 percent, and credit application

incomplete by 10 percent. Only collateral and credit history increase the odds of denial by 31 percent and 12 percent, respectively, if the applicant is white.

Adding an interaction variable of race and income to the multinomial logit regression provided some additional insight on the effects of changes of income on reasons for denial. For every $1,000 increase in income, being Black increases the odds of denial for employment history by 0.7 percent and insufficient funds by 0.4 percent. For every 1,000 increase in income, being Latino decreases the odds of denial for debt-to-income ratio by 0.5 percent and for employment history by 1.4 percent. However, for every $1,000 increase in income, being Latino increases the odds of denial for credit history by 0.1 percent and for an incomplete credit application by 0.1 percent. For every increase in $1,000 of income, being white increases the odds of denial for debt-to-income ratio by 0.6 percent and for collateral by 0.1 percent.

Adding in interaction variable, race * income, to the analysis showed some significant results. Even with the $1,000 increase in income, being Black increases the odds of denial for employment history and insufficient funds and being Latino increases the odds of denial for credit history and incomplete credit application. Such results show additional measures, beyond additional income must be taken to address denial rates among Black and Latino households. However, for a $1,000 increase in income, being Latino decreased the odds of denial for debt-to-income ratio and employment history.

This research uncovered that in the Atlanta Metro region Blacks and Latinos are more likely to be denied for a loan than white applicants during the time period, 2012 - 2017. Among the reasons for denial reported by HMDA data, credit history, debt-to-income ratio, insufficient funds, employment history, and incomplete credit application are the largest barriers to home loan mortgage approval for Latino and Black households.

The reasons for denial, *unverified information* and *other*, were statistically significant for a Black, Latino, and White applicants at various points within the multinomial logit regression analysis; it would be necessary to review the loan approval process and ensure all reasons for denial are identified and included in reporting procedures. For now, it is important to identify policy and practice remedies to reduce the presence of disparate impact by race in the mortgage lending market and bridge the racial wealth divide.

Increasing the DTI ratio, allowing for alternative methods of measuring credit-worthiness, and creating programs requiring smaller down-payments in addition to reduced upfront costs are ways to restructure home mortgages that reach Black and Latino households. Beyond these structural changes, nation-wide policies and initiatives must be created to respond to the systemic negative impact of the subprime lending crisis. A responsive effort includes expunging records negatively impacted by the subprime mortgage crisis so that households of color can more easily take advantage of homeownership.

Without significant change to federal policy and lending practice, the racial wealth gap in America will persist. White households will continue to enjoy greater advantages over households of color in meeting the financial obligations of everyday life, accessing new investment opportunities that generate additional wealth, and creating a wealth advantage for their children who can pass it forward. Bridging the wealth divide means for households of color: stability, economic mobility, improved health and well-being, educational achievement, and generational wealth.

Improving access to credit through reducing the incidence of denial among households of color is one of many ways to reduce the racial wealth gap. This research contributes to this topic evidence of racial discrimination in the Atlanta metro mortgage market and areas for new policy, practice, and research that work to increase homeownership among Black and Latino households and reduce the racial wealth gap.

Work Cited:

Acolin, A., Goodman, L., & Wachter, S. (2019). Accessing Homeownership With Credit Constraints, Housing Policy Debate, 29:1, 108-125, DOI: 10.1080/10511482.2018.1452042

Agarwal, S., Amromin, G., Ben-David, I., Chomsisengphet, & S., Evanoff, D. (2014) Predatory lending and the subprime crisis, Journal of Financial Economics, Volume: 1:113, 29-52, DOI: https://doi.org/10.1016/j.jfineco.2014.02.008.

Alvaredo, F., Garbinti, B., & Piketty, T. (2017). On the share of inheritance in aggregate wealth: Europe and the USA, 1900–2010. *Economica*, *84*(334), 239-260.

Amadeo, K. (2018) "Racial wealth gap in the United States: How to close it." *The Balance,* December 11. https://www.thebalance.com/racial-wealth-gap-in-united-states-4169678

Atlanta Neighborhood Development Partnership, Inc. (2019). Study of Homeowner Savings, Retention and Wealth Creation for ANDP Homebuyers in Metro Atlanta. Atlanta, GA: Atlanta Neighborhood Development Partnership, Inc.

Avery, R.B., P.E. Beeson, and M.S. Sniderman. (1993) "Accounting for Racial Differences in Housing Credit Markets," U.S. Department of Housing and Urban Development: Federal Reserve Bank of Cleveland.

Bostic, Raphael W., and Brian J. Surette. "Have the Doors Opened Wider? Trends in Homeownership Rates by Race and Income." SpringerLink, Kluwer Academic Publishers, Nov. 2001, link.springer.com/article/10.1023/A:1017960321898

Canner, Glenn B., and Delores S. Smith. (1991). "Home Mortgage Disclosure Act: Expanded Data on Residential Lending," Federal Reserve Bulletin 77 (November), 859-881.

Canner, Glenn B., and Delores S. Smith. (1992). "Expanded HMDA Data on Residential Lending: One Year Later," Federal Reserve Bulletin 78 (November), 801-824

Center for American Progress. (2018). "Systematic inequality: How America's structural racism helped create the Black-White wealth gap." February 21. www.americanprogress.org/issues/race/reports/2018/02/21/447051/systematic-inequality/

Chetty, R., Hendren, N., Kline, P., & Saez, E. (2014). "Where is the land of opportunity? The geography of intergenerational mobility in the United States." *The Quarterly Journal of Economics, 129*(4): 1553-1623. https://www.nber.org/papers/w19843.pdf

Darity Jr, W., Hamilton, D., Paul, M., Aja, A., Price, A., Moore, A., & Chiopris, C. (2018). "What we get wrong about closing the racial wealth gap." *Samuel DuBois Cook Center on Social Equity.* http://narrowthegap.org/images/documents/Wealth-Gap---FINAL-COMPLETE-REPORT.pdf

Deng Y., Quigley J. M., Van Order R., & Freddie Mac (1996). Mortgage default and low down payment loans: The costs of public subsidy. Regional Science and Urban Economics, 26, 263–285.

Demos and Institute for Assets and Social Policy. (2016). "The racial wealth gap: Why policy matters." https://www.demos.org/publication/racial-wealth-gap-why-policy-matters

Dietrich, Jason, et al. "Data Point: 2017 Mortgage Market Activity and Trends: A First Look at the 2017 HMDA Data." *Consumer Financial Protection Bureau*, 18 May 2018, www.consumerfinance.gov/data-research/research-reports/cfpb-data-point-mortgage-market-activity-and-trends/

Jacob W. Faber (2013) Racial Dynamics of Subprime Mortgage Lending at the Peak, Housing Policy Debate, 23:2, 328-349, DOI: 10.1080/10511482.2013.771788

Florida, R. (2017). "Gentrification has virtually no effect on homeowners." *CityLab*, January 24. https://www.citylab.com/equity/2017/01/gentrification-hurts-renters-more-than-homeowners/510074/

Frost, Jim, et al. "Regression Tutorial with Analysis Examples." Statistics By Jim, 13 June 2019, statisticsbyjim.com/regression/regression-tutorial-analysis-examples/

Galante, C., Reid, C., & Sanchez-Moyano, R. (2017). "Expanding access to homeownership through lease-purchase." University of California, Berkeley, Turner Center for Housing Innovation. https://healthyplacesindex.org/wpcontent/uploads/2018/03/expanding_homeownership_lease_purchase.pdf

Haurin, Donald R., Patric H. Hendershott, and Susan M. Wachter. 1997. "Borrowing Constraints and the Tenure Choice of Young Households," Journal of Housing Research 8 (2): 137-154. - 1996. "Wealth Accumulation and Housing Choices of Young Households: An Exploratory Investigation," Journal of Housing Research 7 (1): 33-57. Department of Housing and Urban Development, Office of Policy Development and Research.

Herbert C. E., & Tsen W. (2007). The potential of downpayment assistance for increasing homeownership among minority and low-income households. Cityscape, 9, 153–183

Hirt, Mary. (2018) "Homeownership and Racial Wealth Disparity in the Southeast: Factor Ratio Reweighting Analysis of Homeownership in Six Southeast States and the Importance of Race-Conscious Housing Policies." Atlanta, GA: Georgia Institute of Technology.

Immergluck, D., Earl, S., & Powell, A. (2018). "Black homebuying after the crisis: Appreciation and segregation patterns in fifteen large metropolitan areas." GSU Urban Studies Institute Working Paper. https://www.researchgate.net/publication/328031809_Black_Homebuying_after_the_Crisis_Appreciation_and_Segregation_Patterns_in_Fifteen_Large_Metropolitan_Areas

Jeevan, Manu. "Step-by-Step Guide to Execute Linear Regression in R." Edvancer Eduventures, 2017, www.edvancer.in/step-step-guide-to-execute-linear-regression-r/

Joint Center for Housing Studies. (2018). "The state of the nation's housing." http://www.jchs.harvard.edu/state-nations-housing-2018

Kelly A. (2008). "Skin in the game": Zero down payment mortgage default. Journal of Housing Research, 17, 75–99.

Linneman, Peter, and Susan Wachter. 1989. "The Impact of Borrowing Constraints on Homeownership," AREUEA Journal 17 (4): 389-402.

Martin, I. W., & Beck, K. (2018). "Gentrification, property tax limitation, and displacement." *Urban Affairs Review*, *54*(1), 33-73. https://journals.sagepub.com/doi/abs/10.1177/1078087416666959

McMullen, T. (2019). "The 'heartbreaking' decrease in Black homeownership: Racism and rollbacks in government policies are taking their toll." *The Washington Post*, February 28. https://www.washingtonpost.com/news/business/wp/2019/02/28/feature/the-heartbreaking-decrease-in-Black-homeownership/?utm_term=.6c2b9900d1f3

Meschede, T., Taylor, J., Mann, A., & Shapiro, T. M. (2017). "Family achievements?: How a college degree accumulates wealth for whites and not for Blacks." Federal Reserve Bank of St. Louis Review, *99*(1): 121-137. https://files.stlouisfed.org/files/htdocs/publications/review/2017-02-15/family-achievements-how-a-college-degree-accumulates-wealth-for-whites-and-not-for-Blacks.pdf

Moore, A. and Bruenig, M. (2017). "Without the family car Black wealth barely exists." People's Policy Project, Sept. 30. https://www.peoplespolicyproject.org/2017/09/30/without-the-family-car-Black-wealth-barely-exists/

Munnell, Alicia H., Geoffrey M. B. Tootell, Lynn E. Browne, and James McEneaney. (1996). "Mortgage Lending in Boston: Interpreting HMDA Data," American Economic Review 86 (March), 25-53.

National Association of Real Estate Brokers. (2018). "2018 State of Housing in Black America" http://www.nareb.com/shiba-report/

Quercia R. G., Ding L., & Reid C. (2012). Balancing risk and access: Underwriting standards and qualified residential mortgages. Chapel Hill, NC: Center for Community Capital; Durham, NC: Center for Responsible Lending. Retrieved from http://www.responsiblelending.org/mortgage-lending/research-analysis/Underwriting-Standards-for-Qualified-Residential-Mortgages.pdf.

Quercia R. G., McCarthy G. W., & Wachter S. M. (2003). The impacts of affordable lending efforts on homeownership rates. Journal of Housing Economics, 12, 29–59.

"R Regression Models Workshop." Rstatistics, Harvard University, 2019, tutorials.iq.harvard.edu/R/Rstatistics/Rstatistics.html.

Reynolds, A.J., Chen, C.C., & Herbers, J. E. (2009). "School mobility and educational success: A research synthesis and evidence on prevention." Presented at the Workshop on the Impact of Mobility and Change on the Lives of Young Children, Schools, and Neighborhoods, June 29-30, 2009.http://www.nationalacademies.org/hmd/~/media/E82266FA9F9B4D6C87535F1E2FC1B1D9.ashx

Schafer, Robert, and Helen F. Ladd (1981) "Discrimination in Mortgage Lending." Cambridge, Mass.: MIT Press.

Semuels, A. (2019) "When Wall Street is your landlord." *The Atlantic*, February 13. https://www.theatlantic.com/technology/archive/2019/02/single-family-landlords-wall-street/582394/

Shapiro, T., Meschede, T., & Osoro, S. (2013). “The roots of the widening racial wealth gap: Explaining the Black-white economic divide.” Institute on Assets and Social Policy, research and policy brief. http://health-equity.lib.umd.edu/4120/1/racialwealthgapbrief.pdf

The Pew Charitable Trusts. (2013). "Moving on up: Why do some Americans leave the bottom of the economic ladder, but not others?" https://www.pewtrusts.org/~/media/assets/2013/11/01/movingonuppdf.pdf

Turner, M. A., & Skidmore, F. (1999). Mortgage lending discrimination: A review of existing evidence. Urban Institute. www.urban.org/housing/mortgage_lending.html

Urban Institute. (2017). “Nine charts about wealth inequality in America.” http://apps.urban.org/features/wealth-inequality-charts/

Urban Institute. (2018a). “Barriers to accessing homeownership: Down payment, credit, and affordability.” https://www.urban.org/research/publication/barriers-accessing-homeownership-down-payment-credit-and-affordability-2018

Urban Institute. (2018b). “Millennial homeownership: Why is it so low, and how can we increase it?” https://www.urban.org/sites/default/files/publication/98729/2019_01_11_millennial_homeownership_finalizedv2.pdf

U.S. Government Accountability Office. (2005). Mortgage financing: Additional action needed to manage risks of FHA-insured loans with down payment assistance (Report No. GAO-06-24). Washington, DC.

Zorn, Peter. 1989. "Mobility-Tenure Decisions and Financial Credit: Do Mortgage Qualification Requirements Constrain Homeownership?" AREUEA Journal 17 (4): 1-16.

Appendix A: Variables: Transformations, Source, Type

Variable	Transformations	Sources	In Codebook as…	Type
Race: White applicants	Code as "1" Other Races: "0"	HMDA	"5"	Discrete
Race: Black applicants	Code as "1" Other Races: "0"	HMDA	"3"	Discrete
Ethnicity: Hispanic or Latino applicants	Code as "1" Other Ethnicities: "0"	HMDA	"1"	Discrete
Sex: Female Applicants	Code as "1" Male: "0"	HMDA	"2"	Discrete
Sex: Male Applicants	Code as "1" Female: "0"	HMDA	"1"	Discrete
Gross Annual Income	No transformation	HMDA	In thousands of dollars	Continuous
Loan Amount Requested	No transformation	HMDA	In thousands of dollars	Continuous
Minority Pop Percent by Tract	No transformation		Percent of Tract	Continuous
Tract Income	Multiplied MSAMD income as a percentage by the HUD Median Family Income	HMDA	Tract Income * Median Family Income	Continuous
Action Taken: Loan Originated	Code as "0"	HMDA	"1"	Discrete
Action Taken: Loan Approved Not Accepted	Code as "0"	HMDA	"2"	Discrete
Action Taken: Loan Purchased by Institution	Code as "0"	HMDA	"6"	Discrete
Action Taken: Preapproval Accepted by Financial Institution	Code as "0"	HMDA	"8"	Discrete
Action Taken: Application Denied by Financial Institution	Code as "1"	HMDA	"3"	Discrete
Action Taken: Preapproval Denied by Financial Institution	Code as "1"	HMDA	"7"	Discrete
Action Taken: File Closed for Incompleteness	Code as "1"	HMDA	"5"	Discrete
Denial Reason: Collateral	No Transformation	HMDA	"4"	Discrete
Denial Reason: Credit Application Incomplete	No Transformation	HMDA	"7"	Discrete
Denial Reason: Credit History	No Transformation	HMDA	"3"	Discrete
Denial Reason: Debt-to-income	No Transformation	HMDA	"1"	Discrete
Denial Reason: Employment History	No Transformation	HMDA	"2"	Discrete
Denial Reason: Insufficient Cash (Downpayment, Closing Costs)	No Transformation	HMDA	"5"	Discrete
Denial Reason: Mortgage Insurance Denied	No Transformation	HMDA	"8"	Discrete
Denial Reason: Unverifiable Info	No Transformation	HMDA	"6"	Discrete
Denial Reason: Other	No Transformation	HMDA	"9"	Discrete

Appendix B: Codebook for HMDA Data

LOAN INFORMATION

Loan Type:
1 -- Conventional (any loan other than FHA, VA, FSA, or RHS loans)
2 -- FHA-insured (Federal Housing Administration)
3 -- VA-guaranteed (Veterans Administration)
4 -- FSA/RHS (Farm Service Agency or Rural Housing Service)
Property Type:
1 -- One to four-family (other than manufactured housing)
2 -- Manufactured housing
3 -- Multifamily

Loan Purpose:
1 -- Home purchase
2 -- Home improvement
3 -- Refinancing

Owner-Occupancy:
1 -- Owner-occupied as a principal dwelling
2 -- Not owner-occupied
3 -- Not applicable

Loan Amount: in thousands of dollars

Preapproval:
1 -- Preapproval was requested
2 -- Preapproval was not requested
3 -- Not applicable

Action Taken:
1 -- Loan originated
2 -- Application approved but not accepted
3 -- Application denied by financial institution
4 -- Application withdrawn by applicant
5 -- File closed for incompleteness
6 -- Loan purchased by the institution
7 -- Preapproval request denied by financial institution
8 -- Preapproval request approved but not accepted (optional reporting)

APPLICANT INFORMATION

Ethnicity:
1 -- Hispanic or Latino
2 -- Not Hispanic or Latino
3 -- Information not provided by applicant in mail, Internet, or telephone application
4 -- Not applicable
5 -- No co-applicant

Race:
1 -- American Indian or Alaska Native
2 -- Asian
3 -- Black or African American
4 -- Native Hawaiian or Other Pacific Islander
5 -- White

6 -- Information not provided by applicant in mail, Internet, or telephone application
7 -- Not applicable
8 -- No co-applicant

Sex:
1 -- Male
2 -- Female
3 -- Information not provided by applicant in mail, Internet, or telephone application
4 -- Not applicable
5 -- No co-applicant

Gross Annual Income: in thousands of dollars

PURCHASER AND DENIAL INFORMATION

Type of Purchaser
0 -- Loan was not originated or was not sold in calendar year covered by register
1 -- Fannie Mae (FNMA)
2 -- Ginnie Mae (GNMA)
3 -- Freddie Mac (FHLMC)
4 -- Farmer Mac (FAMC)
5 -- Private securitization
6 -- Commercial bank, savings bank or savings association
7 -- Life insurance company, credit union, mortgage bank, or finance company
8 -- Affiliate institution
9 -- Other type of purchaser

Reasons for Denial:
1 -- Debt-to-income ratio
2 -- Employment history
3 -- Credit history
4 -- Collateral
5 -- Insufficient cash (downpayment, closing costs)
6 -- Unverifiable information
7 -- Credit application incomplete
8 -- Mortgage insurance denied
9 -- Other

OTHER DATA

HOEPA Status (only for loans originated or purchased):
1 -- HOEPA loan
2 -- Not a HOEPA loan

Lien Status (only for applications and originations):
1 -- Secured by a first lien
2 -- Secured by a subordinate lien
3 -- Not secured by a lien
4 -- Not applicable (purchased loans)

Application Date Indicator
0 -- Application Date >= 01-01-2004
1 -- Application Date < 01-01-2004
2 -- Application Date = NA (Not Available)

CENSUS INFORMATION

- Population: total population in tract.
- Minority Population %: percentage of minority population to total population for tract. (Carried to two decimal places)
- FFIEC Median Family Income: FFIEC Median family income in dollars for the
- MSA/MD in which the tract is located (adjusted annually by FFIEC).
- Tract to MSA/MD Median Family Income Percentage: % of tract median family income compared to MSA/MD median family income. (Carried to two decimal places)
- Number of Owner Occupied Units: Number of dwellings, including individual
- condominiums, that are lived in by the owner.
- Number of 1- to 4-Family units: Dwellings that are built to house fewer than 5 families.